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ANNUAL REPORT
OF THE
LIGHT-HOUSE BOARD
TO THE
SECRETARY OF THE TREASURY
FOR THE
FISCAL YEAR ENDED JUNE 30, 1891.

Lawrence Scientific School.

ENGINEERING DEPARTMENT.

No.

ANNUAL REPORT
OF THE
LIGHT-HOUSE BOARD

TO THE
SECRETARY OF THE TREASURY

FOR THE
FISCAL YEAR ENDED JUNE 30, 1891.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1891.

TREASURY DEPARTMENT.
Document No. 1469.
Light-House Board.

214-67
19-3

LIGHT-HOUSE BOARD OF THE UNITED STATES.

Organized in conformity to the act of Congress approved August 31, 1852.

LIST OF MEMBERS ON JULY 1, 1891.

Hon. CHARLES FOSTER, Secretary of the Treasury, *ex officio* president.
Commodore JAMES A. GREER, U. S. Navy.
Prof. THOMAS C. MENDENHALL, Superintendent of the U. S. Coast and Geodetic Survey.
Brig. Gen. THOMAS L. CASEY, Chief of Engineers, U. S. Army.
Mr. WALTER S. FRANKLIN.
Capt. HENRY L. HOWISON, U. S. Navy.
Col. WILLIAM P. CRAIGHILL, Corps of Engineers, U. S. Army.
Commander GEORGE W. COFFIN, U. S. Navy.
Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army.

EXECUTIVE MEMBERS OF THE BOARD.

Chairman.—Commodore JAMES A. GREER, U. S. Navy.
Naval Secretary.—Commander GEORGE W. COFFIN, U. S. Navy.
Engineer Secretary.—Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army.

OFFICERS IN CHARGE OF LIGHT-HOUSE DISTRICTS.

FIRST DISTRICT.

Inspector.—Commander FRANK WILDES, U. S. Navy, Portland, Me.
Engineer.—Maj. WILLIAM S. STANTON, Corps of Engineers, U. S. Army, Boston, Mass.

SECOND DISTRICT.

Inspector.—Commander GEORGE F. F. WILDE, U. S. Navy, Boston, Mass.
Engineer.—Maj. WILLIAM S. STANTON, Corps of Engineers, U. S. Army, Boston, Mass.

THIRD DISTRICT.

Inspector.—Capt. FREDERICK RODGERS, U. S. Navy, to September 22, 1890; Capt. HENRY F. PICKING, U. S. Navy, Tompkinsville, N. Y., from September 22, 1890.
Engineer.—Maj. DAVID PORTER HEAP, Corps of Engineers, U. S. Army, Tompkinsville, N. Y.

FOURTH DISTRICT.

Inspector.—Commander PURNELL F. HARRINGTON, U. S. Navy, Philadelphia, Pa.
Engineer.—Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army, Philadelphia, Pa.

FIFTH DISTRICT.

Inspector.—Commander CHARLES J. TRAIN, U. S. Navy, Baltimore, Md.

Engineer.—Capt. JOHN C. MALLERY, Corps of Engineers, U. S. Army, Baltimore, Md.

SIXTH DISTRICT.

Inspector.—Lieut. Commander ROSWELL D. HITCHCOCK, U. S. Navy, to September 10, 1890; Commander JAMES G. GREEN, U. S. Navy, Charleston, S. C., from September 10, 1890.

Engineer.—Capt. JOHN C. MALLERY, Corps of Engineers, U. S. Army, Baltimore, Md.

SEVENTH DISTRICT.

Inspector.—Commander GEORGE R. DURAND, U. S. Navy, Pensacola Navy-Yard, Fla.

Engineer.—Capt. WALTER L. FISK, Corps of Engineers, U. S. Army, to February 9, 1891; Maj. JAMES B. QUINN, Corps of Engineers, U. S. Army, New Orleans, La., from February 9, 1891.

EIGHTH DISTRICT.

Inspector.—Lieut. Commander GEORGE B. LIVINGSTON, U. S. Navy, to October 3, 1890; Commander CHARLES J. BARCLAY, U. S. Navy, to January 1, 1891; Commander DENNIS W. MULLAN, U. S. Navy, New Orleans, La., from January 1, 1891.

Engineer.—Capt. WALTER L. FISK, Corps of Engineers, U. S. Army, to February 9, 1891; Maj. JAMES B. QUINN, Corps of Engineers, U. S. Army, New Orleans, La., from February 9, 1891.

NINTH DISTRICT.

Inspector.—Commander CHARLES E. CLARK, U. S. Navy, to April 30, 1891; Commander NICOLL LUDLOW, U. S. Navy, Chicago, Ill., from April 30, 1891.

Engineer.—Maj. WILLIAM LUDLOW, Corps of Engineers, brevet lieutenant-colonel, U. S. Army, Detroit, Mich.

TENTH DISTRICT.

Inspector.—Commander CHARLES V. GRIDLEY, U. S. Navy, to June 30, 1891; Commander EDWIN T. WOODWARD, U. S. Navy, Buffalo, N. Y., from June 30, 1891.

Engineer.—Maj. LEWIS C. OVERMAN, Corps of Engineers, U. S. Army, Cleveland, Ohio.

ELEVENTH DISTRICT.

Inspector.—Commander OSCAR F. HEYERMAN, U. S. Navy, Detroit, Mich.

Engineer.—Maj. WILLIAM LUDLOW, Corps of Engineers, brevet lieutenant-colonel, U. S. Army, Detroit, Mich.

TWELFTH DISTRICT.

Inspector.—Lieut. Commander THOMAS PERRY, U. S. Navy, San Francisco, Cal.

Engineer.—Maj. WILLIAM H. HEUER, Corps of Engineers, U. S. Army, San Francisco, Cal.

THIRTEENTH DISTRICT.

Inspector.—Lieut. Commander WILLIAM W. RHOADES, U. S. Navy, Portland, Oregon.

Engineer.—Maj. THOMAS H. HANDBURY, Corps of Engineers, U. S. Army, Portland, Oregon.

FOURTEENTH DISTRICT.

Inspector.—Commander CHARLES MCGREGOR, U. S. Navy, Cincinnati, Ohio.

Engineer.—Lieut. Col. WILLIAM E. MERRILL, Corps of Engineers, brevet colonel, U. S. Army, Cincinnati, Ohio.

FIFTEENTH DISTRICT.

Inspector.—Commander CHARLES S. COTTON, U. S. Navy, to November 30, 1890; Commander WILLIAM C. WISE, U. S. Navy, St. Louis, Mo., from November 30, 1890.

Engineer.—Lieut. Col. CHARLES R. SUTER, Corps of Engineers, U. S. Army, St. Louis, Mo.

SIXTEENTH DISTRICT.

Inspector.—Lieut. Commander ROBERT M. BERRY, U. S. Navy, Memphis, Tenn.

Engineer.—Lieut. Col. CHARLES R. SUTER, Corps of Engineers, U. S. Army, St. Louis, Mo.

REPORT

OF

THE UNITED STATES LIGHT-HOUSE BOARD.

TREASURY DEPARTMENT,
OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, D. C., October 26, 1891.

SIR: The Light-House Board has the honor to submit, for your information and that of Congress, the following report of the work done under its direction during the fiscal year which ended on June 30, 1891:

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights, including the 299 post-lights in the third, fourth, fifth, sixth, eighth, twelfth, and thirteenth light-house districts.	1, 167
Light-ships in position	28
Light-ships for relief	4
Electric buoys in position	6
Gas buoys in position	1
Fog-signals operated by steam or hot air	92
Fog-signals operated by clockwork	186
Post-lights on the western rivers	1, 368
Day or unlighted beacons	391
Whistling buoys in position	59
Bell buoys in position	79
Others buoys in position, including pile buoys and stakes in fifth district and thirty buoys in Alaskan waters	4, 204

In the construction, care, and maintenance of these aids to navigation there were employed:

Steam tenders	28
Steam launches	4
Sailing tenders	2
Light-keepers	1, 082
Other employes, including crews of light-ships and tenders	868
Boatswains in charge of western river lights	1, 126

NEW LIGHTS.

The following-named new lights were established during the fiscal year:

Coney Island, New York Harbor, New York.—A fourth-order light, August 1, 1890.

- Ballast Point entrance to San Diego Bay, California.*—A fifth-order light. August 1, 1890.
- Pont Water Pierhead Range, Lake Michigan, Michigan.*—A tubular-lantern light. August 15, 1890.
- Essex Point, Lake Champlain, New York.*—A tubular-lantern light, October 19, 1890.
- Great Round Neck Light-Vessel, eastern entrance to Vesterbet Sound, Massachusetts.*—Two fixed white reflective lights. October 11, 1890.
- Burlington Breakwater North Extension Pierhead north end, Burlington Harbor, Lake Champlain, Vermont.*—A sixth-order light, October 22, 1890.
- Burlington Breakwater North Extension Pierhead south end, Burlington Harbor, Lake Champlain, Vermont.*—A tubular-lantern light. October 22, 1890.
- Margaret Breakwater, Lake Superior, Michigan.*—A sixth-order light, December 4, 1890.
- Lake Umbagog entrance to Lake Umbagog, Maine.*—A fifth-order light. December 31, 1890.
- Great Duck Island, western of Maine.*—A fifth-order light. December 31, 1890.
- Great Rocks, eastern entrance to Fox Island Passage, Maine.*—A fifth-order light. December 31, 1890.
- Swamp Head Channel Range Point Light, Cape Fear River, North Carolina.*—Two lantern-lights. December 31, 1890.
- Essex Point Channel Range Point Light, Cape Fear River, North Carolina.*—Two lantern-lights. December 31, 1890.
- Gasperine Island, entrance to Charlotte Harbor, Florida.*—A three and one-half order light. December 31, 1890.
- Gasperine Island Range Beacon, entrance to Charlotte Harbor, Florida.*—A lantern-light. December 31, 1890.
- Charlotte Harbor, Charlotte Harbor, Florida.*—A fifth-order light, December 31, 1890.
- Hendricks Point Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.
- Leonard Point Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.
- Grassy Point Middle Ground upper end Point Light, No. 3, St. Johns River, Florida.*—Two lantern-lights. January 1, 1891.
- New-Me Point Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.
- Edgemoor Grove Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.
- Morgan Island North Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.
- Swisher Bay Point Light, No. 3, St. Johns River, Florida.*—A tubular-lantern light. January 1, 1891.

Horse Landing Post-Light, No. 69½, St. Johns River, Florida.—A tubular-lantern light, January 1, 1891.

Fort Gates Post-Light, No. 75, St. Johns River, Florida.—A tubular-lantern light, January 1, 1891.

Georgetown Post-Light, No. 106½, St. Johns River, Florida.—A tubular-lantern light, January 1, 1891.

Salisbury Beach Range, entrance to Newburyport Harbor, Massachusetts.—Two tubular-lantern lights, January 6, 1891.

West Chop Light-Station, Vineyard Sound, Massachusetts.—An additional light (tubular lantern), January 26, 1891.

Gull Shoal, Pamlico Sound, North Carolina.—A fourth-order light, February 1, 1891.

Roe Island, Suisun Bay, California.—A fifth-order light, February 16, 1891.

Pamlico Point, Pamlico Sound, North Carolina.—A fourth-order light, March 9, 1891.

Point Loma, seacoast of California.—A third-order light, March 23, 1891.

Chicago Pierhead Range (front), Chicago Harbor, Lake Michigan, Illinois.—A tubular-lantern light, March 31, 1891.

Gordon Landing Pierhead, Lake Champlain, Vermont.—A tubular-lantern light, April 14, 1891.

Newport News Middle Ground, Hampton Roads, Virginia.—A fourth-order light, April 15, 1891.

South Pass East Jetty, Mississippi River, Louisiana.—A fifth-order light, April 15, 1891.

Head of the Passes West Jetty, Mississippi River, Louisiana.—A fifth-order light, April 15, 1891.

Grosse Isle Range, Detroit River, Michigan.—Two lens-lantern lights, April 20, 1891.

Portage Lake Pierhead Range, Lake Michigan, Michigan.—A fourth-order light and a lens-lantern light, April 30, 1891.

Cedar River Range, Green Bay, Michigan.—Two tubular-lantern lights, opening of navigation, 1891.

Windmill Point Range, Detroit River, Michigan.—A sixth-order light and a lens-lantern light, May 20, 1891.

Walker Island Post-Light, Columbia River, Oregon.—A tubular-lantern light, May 22, 1891.

Barlow Point Post-Light, Columbia River, Washington.—A tubular-lantern light, May 22, 1891.

Sid-Channel Post-Light, Columbia River, Washington.—A tubular-lantern light, May 22, 1891.

Mount Coffin Post-Light, Columbia River, Washington.—A tubular-lantern light, May 22, 1891.

Hunters Post-Light, Columbia River, Oregon.—A tubular-lantern light, May 22, 1891.

Wachusett Harbor, Massachusetts.—A bell struck by machinery, July 20, 1891.

Distress Signal, Cleveland Harbor, 1891. (Displayed from fog-signal crew of wrecks near the break-

necticut.—A tubular-lantern light,

, Connecticut.—A tubular-lantern

necticut.—A tubular-lantern light,

necticut.—A tubular-lantern light,

necticut.—A tubular-lantern light,

SIGNALS.

were established at the following—

—A bell struck by machinery, July

achusetts.—A bell struck by machin-

ine.—A bell struck by machinery,

e.—A bell struck by machinery,

ornia.—A 10-inch steam whistle,

n.—A 10-inch steam whistle, Sep-

isconsin.—A 10-inch steam whistle,

Massachusetts.—A bell struck by

chigan.—A first-class steam siren,

—A bell struck by hand in answer

Varrows, Maine.—A bell struck by

ox Island Thoroughfare, Maine.—A bell struck by hand, April 20, 1891.

River, Lake Huron, Michigan.—A bell struck by hand, March 20, 1891.

Esopus Meadows, Hudson River, New York.—A bell struck by machinery, opening of navigation, 1891.

La Pointe, Lake Superior, Wisconsin.—A 10-inch steam whistle, opening of navigation, 1891.

The following-named new fog signals were established during the fiscal year:

Coney Island, New York Harbor, New York.—A bell struck by machinery, August 1, 1890.

Ballast Point, entrance to San Diego Bay, California.—A bell struck by machinery, August 1, 1890.

Old Mackinac Point, Straits of Mackinac, Michigan.—A 10-inch steam whistle, November 5, 1890.

Great Duck Island, seacoast of Maine.—A 10-inch steam whistle, December 31, 1890.

Gull Shoal, Pamlico Sound, North Carolina.—A bell struck by machinery, February 1, 1891.

Roe Island, Suisun Bay, California.—A bell struck by machinery, February 1, 1891.

Cubits Gap, Mississippi River, Louisiana.—A bell struck by machinery, March 1, 1891.

Pamlico Point, Pamlico Sound, North Carolina.—A bell struck by machinery, March 9, 1891.

Newport News Middle Ground, Hampton Roads, Virginia.—A bell struck by machinery, April 15, 1891.

South Pass East Jetty, Mississippi River, Louisiana.—A bell struck by machinery, April 15, 1891.

LIGHTS DISCONTINUED.

The following-named lights were, in the course of the fiscal year, discontinued:

Petty Island Range Post-Lights, Delaware River, New Jersey.—Two tubular-lantern lights, September 1, 1890.

Newburyport Harbor Range (front), entrance to the Merrimac River, Massachusetts.—A reflector light, September 30, 1890.

Burlington Breakwater, North Beacon, Burlington Harbor, Lake Champlain, Vermont.—A sixth-order light, October 22, 1890.

Marquette Breakwater, Lake Superior, Michigan.—A temporary tubular-lantern light, December 4, 1890.

Marsh Island Cut, lower range, Post-Lights, Nos. 5 and 5½, Cape Fear River, North Carolina.—Two tubular-lantern lights, December 31, 1890.

Marsh Island Cut, upper range, Post-Lights, Nos. 6 and 6½, Cape Fear River, North Carolina.—Two tubular-lantern lights, December 31, 1890.

Grassy Point Middle Ground (lower end) Post-Light, No. 32, St. Johns River, Florida.—A tubular-lantern light, January 1, 1891.

- Pamlico Point, Pamlico Sound, North Carolina.*—A temporary lens-lantern light, March 9, 1891.
- Point Loma, seacoast of California.*—A third-order light (in the old tower on the hill), March 23, 1891.
- Rouse Point, Lake Champlain, New York.*—A tubular-lantern light, March 31, 1891.
- South Pass East Jetty, Mississippi River, Louisiana.*—A fifth-order light, April 15, 1891.
- Head of the Passes West Jetty, Mississippi River, Louisiana.*—A lens-lantern light, April 15, 1891.
- Rinearson Point Post-Light, Columbia River, Oregon.*—A tubular-lantern light, May 22, 1891.
- Rinearson Slough Post-Light, Columbia River, Oregon.*—A tubular-lantern light, May 22, 1891.
- Walker Island Bar Range Post-Lights, Columbia River, Oregon.*—Two tubular-lantern lights, May 22, 1891.
- Sandy Island Shoal Post-Light, Columbia River, Washington.*—A tubular-lantern light, May 22, 1891.
- Rood Landing Post-Light, Columbia River, Washington.*—A tubular-lantern light, May, 1891.
- Loves Mill Post-Light, Columbia River, Washington.*—A tubular-lantern light, May, 1891.

CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

- Windmill Point, Detroit River, Michigan.*—Changed from a fixed white light of the fifth order, varied by a red flash every ninety seconds, to a fixed white light of the fourth order, varied by a red flash every fifteen seconds, December 7, 1890.
- North end of Lake George Post-Light, No. 108, St. Johns River, Florida.*—Height of light increased 10 feet, January 1, 1891.
- Newport Wharf, Lake Memphremagog, Vermont.*—Changed from one fixed red to two fixed white tubular-lantern lights, May 11, 1891.
- Newport Harbor (Goat Island), Narragansett Bay, Rhode Island.*—Changed from a fixed white light to an occulting light, showing fixed white for fifteen seconds followed by an occultation of five seconds, May 20, 1891.
- Saginaw River Range (rear), mouth of Saginaw River, Lake Huron, Michigan.*—Changed from a fixed white light to a fixed red light, June 15, 1891.
- Tarpaulin Cove, Vineyard Sound, Massachusetts.*—Height of light increased 2 feet (on new tower), June 30, 1891.

CHANGES IN FOG-SIGNALS.

During the fiscal year, the following changes were made in fog-signals:

Point Reyes, seacoast of California.—Changed from a first-class steam siren to a 12-inch steam whistle, September 30, 1890.

Cleveland Breakwater (east end), Lake Erie, Ohio.—Changed from a bell struck by machinery to a 10-inch steam whistle, October 30, 1890.

Point Iroquois, St. Marys River, Michigan.—Changed from a bell struck by machinery to a 10-inch steam whistle, October 31, 1890.

Skilligallee, Lake Michigan, Michigan.—Changed from a first-class steam siren to a 10-inch steam whistle, November 1, 1890.

Smith Point, Chesapeake Bay, Virginia.—Characteristic of fog-bell changed from a double blow every fifteen seconds to a single blow every fifteen seconds, December 17, 1890.

Castle Hill, east side of entrance to Narragansett Bay, Rhode Island.—Characteristic of fog-bell changed from a single blow every fifteen seconds to a triple blow every ten seconds, December 20, 1890.

CHANGES OF LOCATION OF LIGHTS.

The location of the following-named lights was changed during the fiscal year:

Fishers Point Range Post-Lights, Delaware River, New Jersey.—Moved to the westward, September 1, 1890.

Hilton Head Range (front), entrance to Port Royal Harbor, South Carolina.—Moved 73 feet to the southward to conform to changes in the channels, April 15, 1891.

Sandy Hook Light-Vessel, entrance to New York Harbor, New York.—Moved $2\frac{1}{4}$ nautical miles N.E. by E., and moored on the prolongation of the axis of Gedney Channel, May 15, 1891.

Scotland Light-Vessel, entrance to New York Harbor, New York.—Moved one-half nautical mile N.E. $\frac{3}{4}$ E., and moored on the prolongation of the axis of the South and Swash Channels, May 15, 1891.

Beacon No. 1 Post-Light, Columbia River, Oregon.—Moved about one-eighth mile to the westward, May, 1891.

La Du Post-Light, Columbia River, Washington.—Moved, about one-fourth mile E.S.E. $\frac{1}{8}$ E., to a pile on the north side of the channel, May, 1891.

Elm Tree (Swash Channel Range, front), New York Lower Bay, New York.—Moved about 265 feet N.E. $\frac{1}{2}$ E. to mark the axis of the Swash Channel, June 30, 1891.

NEW BUOYS.

During the fiscal year the following-named special buoys were established:

Point Buchon, seacoast of California.—A whistling buoy, September 15, 1890.

REPORT OF THE LIGHT-HOUSE BOARD.

Woe Rock, entrance to Gloucester Harbor, Massachusetts.—A buoy, September 24, 1890.

Reef, Long Island Sound, New York.—A bell buoy, November 1, 1890.

er (Cutler) Harbor, Maine.—A whistling buoy, November 90.

to Winyah Bay and Georgetown, South Carolina.—A bell April 3, 1891.

ith Breakwater, entrance to Narragansett Bay, Rhode Island.—A buoy, April 16, 1891.

edge, Buzzards Bay, Massachusetts.—A bell buoy, April 27,

BUOYS DISCONTINUED.

ring-named special buoys were discontinued during the

, *seacoast of California.*—A whistling buoy, September 15,

reef, New York Bay, New York.—An experimental bell buoy, mber 3, 1890.

se, seacoast of Virginia.—A bell buoy, March 18, 1891.

nd Ledge, Buzzards Bay, Massachusetts.—A bell buoy, April 91.

CHANGES IN BUOYS.

ie fiscal year the following changes were made in special

ck, entrance to Port Harford, California.—The whistling was changed to a bell buoy, September 15, 1890.

River Entrance, Oregon.—The whistling buoy was moved t 2 miles N.W. by W. $\frac{3}{4}$ W., November 14, 1890.

TEMPORARY CHANGES IN AIDS TO NAVIGATION.

ie fiscal year the following temporary changes were made avigation:

end of Five-Fathom Bank Light-Vessel, seacoast of New Jer-
-The steam whistle disabled, and bell struck by hand substituted as a fog signal September 23, 1890. Light-vessel withdrawn from the station for repairs and the station marked by a ling buoy December 10, 1890. Schooner *S. S. Hudson*, showing white and a red light and having a bell struck by hand as signal, placed on the station December 24, 1890. Light-I returned to the station, and the schooner *S. S. Hudson* and ling buoy discontinued February 15, 1891.

und Shoal Light-Vessel station, eastern entrance to Nantucket d, Massachusetts.—Relief light-vessel No. 9, showing two

fixed white reflector lights, established October 11, 1890, to remain until the light-vessel building for the station is completed. (New vessel placed on station August 1, 1891).

Wreck of the Louisa Smith, entrance to Boston Harbor, Massachusetts.—A tubular-lantern light, established October 22, 1890; discontinued soon after on the disappearance of the wreck.

Fire-Fathom Bank Light-Vessel, seacoast of New Jersey.—Steam whistle disabled and a bell struck by hand substituted as a fog-signal January 2, 1891. Light-vessel withdrawn for repairs and the schooner *Drift* (showing two white lights) and a whistling buoy placed on the station April 30, 1891. Light-vessel returned to her station and the schooner *Drift* and whistling buoy discontinued June 4, 1891.

Vineyard Sound (Sour and Pigs) Light-Vessel, western entrance to Vineyard Sound, Massachusetts.—Withdrawn from her station for repairs and replaced by Relief Light-Vessel No. 39, from April 11 to June 25, 1891.

Tarpaulin Cove, Vineyard Sound, Massachusetts.—Light exhibited from a temporary structure during the rebuilding of the light tower, from April 25 to June 30, 1891.

Pollock Rip Light-Vessel, eastern entrance to Nantucket Sound, Massachusetts.—Withdrawn from her station for repairs and replaced by light-vessel No. 47, from May 20 to June 29, 1891.

Cornfield Point Light-Vessel, Long Island Sound, Connecticut.—Withdrawn from her station for repairs and replaced by Relief Light-Vessel No. 20, from May 22 to June 24, 1891.

Winter-Quarter Shoal Light-Vessel, seacoast of Virginia.—Steam whistle disabled and a bell struck by hand substituted as a fog-signal June 8, 1891.

Cape Charles Light-Vessel, seacoast of Virginia.—Withdrawn from her station for repairs and replaced by Light-Vessel No. 49, June 20, 1891.

Brenton Reef Light-Vessel, entrance to Narragansett Bay, Rhode Island.—Withdrawn from her station for repairs and replaced by Relief Light-Vessel No. 20, June 27, 1891.

Wreck of the ship Palestine Light-Vessel, entrance to San Francisco Bay, California.—Two fixed white reflector lights established June 29, 1891.

Crabtree Ledge, Frenchman Bay, Maine.—A bell struck by machinery, discontinued from November 25 to December 10, 1890.

Wreck of the Steamship Vizcaya, off Barnegat, seacoast of New Jersey.—A whistling buoy established November 2, 1890. A gas-lighted buoy established November 24, 1890. Whistling buoy and gas-lighted buoy discontinued February 1, 1891.

Wreck of the Advance, New York Lower Bay, New York.—A gas-lighted buoy established August 5, 1890, discontinued October 13, 1890.

REPORT OF THE LIGHT-HOUSE BOARD.

1891.

Aids	First district.	Second district.	Third district.	Fourth district.	Fifth district.	Sixth district.	Seventh district.	Eighth district.	Ninth district.	Tenth district.	Eleventh district.	Twelfth district.	Thirteenth district.	Fourteenth district.	Fifteenth district.	Sixteenth district.	Atlantic and coast.	Pacific coast.	Lake coast.	Rivers.	Total for 1890	Total for 1891	Increase.
Electric lights	11	7	13	4	2	8	32	64	90	71	97	37	6	529	501	338	777	130	295	1,268	2,449	2,570	121
Fog signals operated by steam or hot air.	17	19	49	7	64	8	30	11	6	5	4	7	3	3	3	3	38	20	34	84	92	8	
Fog signals operated by clockwork	102	60	37	5	13	33	30	17	11	5	1	49	33	3	3	3	160	10	10	170	166	16	
Day beacons	11	9	5	4	1	4	2	3	1	1	1	12	7	7	7	7	40	19	1	372	391	19	
Whistling buoys	15	13	15	5	2	15	6	3	64	170	152	83	2	2	2	2	70	7	2	75	79	4	
Bell buoys	596	482	541	166	1,194	301	231	84	64	170	152	83	199	199	199	199	3,536	282	385	4,143	4,204	61	
Other buoys																							
Total lighted aids	751	590	660	193	1,215	359	271	115	84	177	177	160	250	529	501	338	4,153	419	439	4,904	5,011	107	
Total unlighted aids	811	670	876	253	1,332	554	303	179	174	248	274	306	343	639	501	338	4,930	549	734	1,368	7,363	7,681	318

APPROPRIATIONS MADE AT THE SECOND SESSION OF THE FIFTY-FIRST CONGRESS FOR
LIGHT-HOUSE PURPOSES.

Ahnapee range or pier lights, Michigan	\$2, 500
Ashtabula Harbor range-lights and fog-signal station, Ohio.....	4, 700
Black River range-lights, Ohio.....	400
Braddock Point light-station, New York.....	20, 000
Cape Charles City range and harbor lights, Virginia.....	1, 000
Coquille River light and fog-signal station, Oregon.....	50, 000
Cuckolds Island fog-signal station, Maine	25, 000
Depot for the ninth light-house district, Michigan.....	35, 000
Depot for the thirteenth light-house district, Oregon.....	15, 000
Devils Island fog-signal station, Wisconsin	5, 500
Fairport range-lights, Ohio.....	400
Genesee fog-signal station, New York.....	4, 300
Gratiot range-lights, Michigan	500
Hawkins Point, Maryland, easement for.....	1, 000
Humboldt light and fog-signal station, California, to move to a more secure site.....	25, 000
Juniper Island buoy depot, Vermont.....	2, 500
Lamp shop at the depot for the eleventh light-house district, Michigan ..	2, 000
Lighting St. Marys River, Michigan.....	30, 000
McWilliams Point Shoal light-station, North Carolina	100
North River Bar beacons, North Carolina.....	2, 000
Northwest Seal Rock steam fog signal, California, authority to expend of former appropriations for	5, 000
Oil houses for light-stations.....	15, 000
Old Mackinac Point light-station, Michigan.....	25, 000
Old Orchard Shoal light and fog-signal station, New York, and Waackaack light-tower, New Jersey	60, 000
Otter Creek light-station, Vermont.....	1, 000
Pages Rock light-station, Virginia	25, 000
Patos Island light and fog-signal station, Washington.....	12, 000
Patrol steamer for St. Marys River, Michigan.....	4, 000
Point Betsey light and fog-signal station, Michigan	5, 500
Portsmouth light-house depot, Virginia	10, 000
Simmons Reef, White Shoal, Grays Reef, Michigan, light-ships, making former appropriation for Simmons Reef light-house available for	60, 000
Squaw Island light and fog-signal station, Michigan.....	25, 000
Staten Island light-house depot, sea-wall New York.....	25, 000
Steam tender for the fifth light-house district	95, 000
Turn Point light and fog-signal station, Washington.....	15, 000
Watch Point light-station, Vermont	500
Windmill Point range-lights, Michigan	3, 000
Total	607, 900

GENERAL.

Supplies of light-houses	375, 000
Repairs of light-houses	345, 000
Salaries of light-keepers.....	645, 000
Expenses of light-vessels	250, 000
Expenses of buoyage	335, 000
Lighted buoys	30, 000
Expenses of fog-signals.....	70, 000

Inspecting lights.....
 Lighting rivers.....
 Survey of light-house sites.....

Total

DEFICIENCIES.

Payment to Susannah George.....
 For salaries of keepers of light-houses for the fiscal year 1889.....
 For lighting of rivers for the fiscal year 1889.....
 For supplies of light-houses for the fiscal year 1889.....

Total

A detailed statement of the work done in each of the light-house districts is made in the body of the report, under separate headings, from which it will be evident that the Board has done numerous and varied aids to navigation under its charge to the proper standard, and that it has done all that was possible with the funds provided, to meet the requirements of commerce and navigation.

THE PROHIBITION OF PRIVATE LIGHTS.

The following recommendation, which has been made in previous annual reports, is renewed:

The Board renews its recommendations that proper steps be taken for the establishment or maintenance of private lights and buoys in the navigable waters of the United States except with the consent of the Board, and its provisions be made to enable it to establish inexpensive and temporary lights in case of exigency and pending the action of Congress. In this connection the Board begs leave to repeat the recommendation made in its annual report:

"Some action should be taken relative to the establishment of lights and buoys by steamboat companies and other private parties, simply for the convenience of their own vessels. The Board can not establish a light without special authority of Congress. It never exhibits a light without previously issuing a formal notice, and it never extinguishes one without giving similar notice in advance to inform all concerned. Private lights are established and maintained without such notice, much to the annoyance of mariners, who are misled by irregular beacons. Besides this, the lights, not being properly maintained, go out from time to time.

"One of the best of these private lights is that exhibited from Battery Park by the municipality of New York City. It has gone out a number of times, and so much to the inconvenience, if not danger, of mariners that it has been made and the Board has been subjected to unmerited criticism for not doing what was alleged to be its duty, when in fact it has not the power over that light. Under these circumstances the Board suggests the regulation of lights and the placing of buoys by corporations or private parties by law. Lest any interest should suffer thereby it is further suggested that the Board, on being satisfied that it is immediately necessary to do so, may establish inexpensive temporary lights, if necessary, on leased land, and pay for their erection and maintenance, together with the cost of employin

as keepers, as is now done on the western rivers, from the general appropriations for the support of the Light-House Establishment, provided that funds can be spared from them for that purpose, and further provided that the Board shall make report of its actions in each case, with the reason therefor, so that Congress may decide as to the continuance of each light."

OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$25,000 could be expended with great advantage during the year, among the larger, more isolated, and more important light-stations. An appropriation of \$15,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$15,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last five years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress for several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations from a plan specially devised after careful study for the purpose.

THE LOWEST BID.

The following recommendation, which was made in the Board's annual report for each year since 1887, is renewed:

The Board calls attention to the hampered condition in which it is left by that provision of law which requires the Board to accept the lowest bid to do work for which it has advertised for proposals, no matter how unfit the bidder or how impossible it may be for him to do good work, provided he can give a good bond. It has repeatedly happened that under this clause the Board has been forced to contract with persons who had no proper plant to do the work; with persons who, to get the work, had bid far below its proper cost, and with persons who had done poor work for the Board under previous contracts, and in each instance the result was, as was to be expected, poor, unsatisfactory, unreliable work, which it was necessary to begin to repair soon after it was finished.

In an instance of this the Board refers to the case of the steamer *Zizania*, which should have been completed more than a year ago. Eight months after she should have been finished the contractors made an assignment, and the Government was obliged to finish the vessel itself. It was then found that much of the work done was of poor a character that it became necessary to do it over. This added largely to the cost of the vessel and increased the time required for building it. The Board needed a tender at the time the appropriation was made for her construction. It would

have had the services more than a year ago if the contracts had been let to the best rather than the lowest bidder. The remedy against the services of contractors for bad work is a fine, but is ineffective. In the few cases where a penalty has been exacted it has been made the basis of claims against Congress which have been sometimes presented to a successful issue. But had it been so there is nothing to prevent failing or fraudulent contractors from becoming the lowest bidders for fresh work. In fact there is nothing under the present state of the law, and the construction given it in putting the failing contractors to the tender *lowest*, but not into as their work was done during the contract for building the new supply ship, for which appropriation has just been made, if that could be enough and can again provide satisfactory workmen. The Board suggests that it may be protected against such evils by appropriate legislation.

The following is the text of section 407, Revised Statutes:

"No contract for the erection of any light-house shall be made except after public advertisement for proposals in such form and manner as to secure general notice thereof, and the same shall not be made with the lowest bidder therefor, upon security deemed sufficient in the judgment of the Secretary of the Treasury."

It is proposed that this section be modified by adding the following proviso:

"Provided, That when, in the opinion of the Secretary of the Treasury, it shall be detrimental to the interests of the Government to contract with the lowest bidder, he shall contract with the next lowest bidder not subject to similar objections, but the Secretary of the Treasury shall put on record his reasons therefor in each such case in the letter rejecting such lowest bid or bids."

NEW WORKS AUTHORIZED.

Congress authorized, by several different acts, the establishment of three different light stations at a cost, in the aggregate, of about \$550,000, but no appropriations were made for their construction. The following is a list of the aids to navigation authorized by these acts, with the maximum amount which each may cost:

Edmond Shoal off Cape Hatteras \$50,000 appropriated, authorized by act of March 1, 1886.....	\$500,000
Rockland Lake light station with fog signal, Chester-Peel Shoal, Hudson River, New York, authorized by act of March 2, 1889.....	35,000
St. Catherine Island light station, Georgia, authorized by act of March 2, 1889.....	20,000

LIGHTING BRIDGES.

The following recommendation, which was made in the Board's annual report for each year since 1887, is renewed:

All persons operating bridges over navigable rivers were required by the act of August 7, 1882, to maintain such lights on them as may be required by the Light-House Board for the security of navigation. The Board in due time, and after careful examination and preparation, issued a set of regulations for lighting such bridges, fully illustrated by diagrams. Persons operating such bridges have, however, obeyed these regulations only so far as they have chosen. The Board, having been unable to induce full compliance with its rules, made a test case of the most important instance of failure to comply with its regulations, and reported the matter through the proper channels to the Department of Justice for legal action. The United States attorney by prosecution, as "the statute prescribes no penalty for its violation and gives no remedy or means for its enforcement."

The United States attorney further states:

"That it is a common-law rule that when a statute forbids or requires an act to be done, an indictment will lie against an offender if the matter involved is one of public concern, but it is a familiar principle of Federal practice that crimes and their penalties must be the subject of specific Federal legislation, and recourse to common-law principles are therefore futile. It seems to me therefore * * * that, in order to remedy the evils to safe navigation in the East River by reason of improper lights upon the Brooklyn Bridge, * * * Congress must pass an act prescribing a punishment for disobedience to the orders of the Light-House Board."

It is therefore submitted that the proper steps should be taken to obtain the suggested legislation.

NECESSARY NEW STRUCTURES.

The following recommendation, made in the Board's annual report for each year since 1887, is renewed:

For several years past the Board has included in its annual estimates of appropriations, under the head of repairs and incidental expenses of light-houses, a clause stating that the objects of the appropriations are to be considered as "including necessary new structures" (see Book of Estimates, 1888-'89, p. 203). The object of this is to sanction a practice which has prevailed since the foundation of the Light-House Establishment until quite recently, viz, the erection at established stations, as the needs of the service may require, of additional structures of small cost from the current annual appropriations. The clause in question has, however, been cut out by the Committee on Appropriations of the House of Representatives from year to year, to the great embarrassment of the service, as under such circumstances the auditing officers are of the opinion that any improvements involving a new structure can not be made, no matter how much it may be needed, or how insignificant the cost may be. This tends to defeat one of the objects for which the appropriation is made, viz, to keep the service in efficient practical working order, and to adapt it to the changing necessities of commerce. It is therefore respectfully asked that steps may be taken to urge Congress to include in the appropriation bill for the coming year the clause in question.

SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1890 was \$350,000, but the number of light stations had increased from 783 in 1889, to 833 in 1890. The appropriation for 1891 was \$375,000 but the number of light stations had increased from 833 in 1890 to 852 in 1891. This number will be still further increased in 1892 by 39 light stations already appropriated for by Congress and which are now being built, and it is fair to expect that appropriations will be made during the next session for still other light stations. The Board has therefore estimated that \$408,000 will be needed for supplies of light-houses during the fiscal year to end on June 30, 1893.

Heretofore certain articles of light-house supply not manufactured in this country were imported duty free. Under the present tariff act duties must be paid on them. This will be an additional drain upon this too slender appropriation. Thus it will be seen that with the means at hand it will be necessary to practice the severest economy to keep the present lights properly supplied.

REPAIRS.

The Board estimated that it would need \$400,000 for repairs and incidental expenses of light-houses for the year 1889-'90; \$335,000 were appropriated in the sundry civil appropriation act, and \$40,000 in the deficiency act, making but \$375,000. That amount was practically expended, and quite a number of important works, which should be in progress, were postponed until another year's appropriation became available. The amount estimated for 1890-'91 was, as before, \$400,000, while but \$340,000 was appropriated. This was insufficient, and the Board was unable from lack of funds to make needed repairs on structures which were suffering rapid deterioration. The Board estimated that at least \$400,000 would be needed for 1891-'92, while but \$345,000 was appropriated. This amount has been disbursed in doing the work which seemed at the time most necessary, which was largely work of restoration. It would now be quite in the interest of economy to do works of prevention. But this can not be done to any extent except much larger appropriation be made for this purpose. The cost of duties laid by the new tariff act upon illuminating apparatus and other material which was formerly admitted duty free must be met. It is therefore suggested that at least \$400,000 should be appropriated for repairs and incidental expenses of light-houses.

SALARIES OF KEEPERS OF LIGHT-HOUSES.

The Board stated in its annual report last year that the number of keepers needed for this year could not be exactly determined, but that it was safe to take 1,150 as a basis, although it was not impossible that the number might be increased to 1,200; and it asked that \$660,000 might be appropriated for the payment of salaries of keepers of light-houses for the current fiscal year. The appropriation made, however, was but \$645,000. The Board had to be governed accordingly, and the result was that on June 30, 1891, there were but 1,082 keepers in the service, instead of 1,150, as the Board had stated would be needed. Hence certain light-houses, which had been built and made ready for service, were not lighted for lack of means to pay light-keepers, and at certain other stations a less number of keepers were employed than were actually needed to do the required work. This has resulted in inferior service of the illuminating apparatus and fog-signal machinery with which they were charged.

There are now 852 light stations in actual operation, which are manned by 1,082 keepers. The number of light-keepers should be increased from 1,082 to 1,119 to properly man these light stations. The number of light stations will be increased from 852 to 891 by 39 light stations already appropriated for by Congress and now being built. These 39 light stations will require at least 60 keepers to properly man them. Hence the number of keepers under salary during the next

fiscal year will be 1,179, without counting the keepers for stations built during that time from appropriations to be made by Congress at its next session. The average salary fixed by law, not to be exceeded, is \$600 per keeper per year, and if the amount to be paid shall not exceed \$575 per keeper per year, \$678,000 will suffice for salaries for light-keepers for the next fiscal year.

The duties of light-keepers have been greatly increased by the addition of steam fog-signal apparatus, requiring, in many cases, the attention of steam engineers. It has been found in practice that the demand upon the ability of a light-keeper will not permit an average salary of less than \$575; with a lower average it is quite difficult to retain in the service men of sufficient ability to properly care for and operate the delicate, complicated, and expensive machinery placed in their charge. Hence it has cost more of late than it did formerly to keep illuminating apparatus and steam fog-signal machinery in repair. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more. Recommendation is therefore made that at least \$678,000 be appropriated for salaries of light-keepers for the next fiscal year.

EXPENSES OF LIGHT-VESSELS.

There were thirty-one light-ships in service on June 30, 1891. The appropriation for the expenses of light-vessels for the fiscal year ending on that date, was \$250,000, and it was all expended in that fiscal year. The Board in its estimates had asked for \$290,000, and the estimate had been based upon an exact knowledge of the needs of the service. Those needs were satisfied as far as was possible with the appropriation made, leaving certain needs yet to be supplied.

Since the date of the last annual report five new light-vessels have been built from special appropriations made therefor and are now on their respective stations. It will cost about \$7,000 a year to maintain each, or \$35,000 to keep the five ships in operation. There are five new light-ships under construction, each of which is being built from a special appropriation. Each new light-ship is to take the place of an old or obsolete vessel, and each will be finished and on its station before the appropriations for 1893 become available. As each of these new vessels is being fitted with propellers, steam fog-signal apparatus, and with new and improved lighting apparatus, it will cost \$3,000 a year more to maintain it than the light-vessel which it will replace. There will be in actual service during the next fiscal year nine more light-ships than there were this year, and it will cost an additional \$50,000 to maintain them. The last appropriation, \$250,000, was all expended, leaving many things to be desired.

The next appropriation should therefore be at least \$50,000 more than the last, or \$300,000.

BUOYAGE.

On July 1, 1890, the beginning of the last fiscal year, there were in place 4,657 buoys, spindles, and day or unlighted beacons. The appropriation for their maintenance during the year was \$335,000, which amount was all expended. On July 1, 1891, the first day of the current fiscal year, there were in place, under this head, 6 electric-lighted buoys, 1 gas-lighted buoy, 59 whistling buoys, 79 bell buoys, and 4,204 iron and wooden buoys of various kinds and sizes, making in all 4,349 buoys. These, together with 391 spindles and day or unlighted beacons, make up a total of 4,740 as against 4,657 of last year, showing an increase of 83 during the past twelve months. The electric-lighted buoys which mark the Gedney Channel into the harbor of New York City continue to give satisfaction. The amount they yearly cost in cables, dynamos, attendance, and the like, is no measure of their value, for they enable the largest steamers to find their way in and out of the harbor as well, if not better, by night than by day. The whistling and bell buoys, while much more costly than ordinary iron and wooden buoys, answer special purposes, and confer a high order of service, which is greatly appreciated by commerce. But the Board has been unable, from lack of funds, to place more than half of the buoys of any kind, or of the beacons asked for, and which it was evident were needed in the interests of commerce and navigation. Beacons and day marks are usually in exposed positions, and are therefore extremely liable to injury and destruction. At present many of them are bent, some were destroyed, and some have lost their cages or are sadly in need of repairs. To put these in proper condition will require an expenditure of at least \$25,000. For the electric buoys of the Gedney Channel \$25,000 is required to purchase cables and keep up the system. For the whistling and bell buoys, and to keep up a reserve stock of buoys and other appurtenances which were heavily drawn upon last year, \$15,000 will be required; therefore, \$400,000 will be required for the expenses of buoyage during the next fiscal year.

LIGHTING RIVERS.

No appropriation made by Congress accomplishes as much, so promptly, and with such satisfaction to its immediate beneficiaries, as that for lighting rivers. There are now about 1,700 lights maintained, at a cost of about \$170 per year for each. They have revolutionized steamboat navigation, making it almost as easy and as safe to run by night as by day, while before the system of river lighting was established it was usual for steamers to stop running and tie up to the banks during dark nights.

Not only is time now saved to steamboats by these lights, but there is a direct saving of money to both owners and shippers in shortening the time in which trips are made, in reducing rates of freight and insurance, and in reducing the liability of the boats to disaster. The tonnage on

the great western rivers on June 30, 1891, was 308,347.55 according to the Bureau of Navigation.

The appropriations made for lighting rivers and the number of lights shown on the rivers for the last six years are shown in the following table:

Year.	Appropriation.	Number of lights.
1887.....	\$190,000	1,258
1888.....	225,000	1,422
1889.....	250,000	1,577
1890.....	251,000	1,584
1891.....	280,000	1,674
1892.....	283,000	*1,700
1893.....	1350,000	‡1,900

* Authorized. † Asked. ‡ Needed on thirty rivers.

Thus it will appear that some 1,674 lights were maintained during the fiscal year which ended on June 30, 1891, from an appropriation of \$283,000, and as the appropriation was all expended, it cost on an average about \$170 to maintain each light for the year. But the Board was unable to establish all the lights on these rivers which were demanded and needed by their increasing commerce, and it was also forced to discontinue certain existing lights that it might make its appropriation for lighting rivers last until the end of the year.

The following is a statement of the names of the rivers lighted during the fiscal year which ended on June 30, 1891, the number of miles lighted on each, and the number of lights exhibited on each:

Names.	Distance lighted.	Number of lights.
	<i>Miles.</i>	
Connecticut River, Connecticut.....	42	22
Hudson River, New York.....	153	28
East River, New York.....	15	10
Raritan River, New Jersey.....	5	3
Delaware River, Pennsylvania.....	130	7
Elk River, Maryland.....	9	2
Cape Fear River, North Carolina.....	23	20
Savannah River, Georgia.....	15	7
St. Johns River, Florida.....	160	80
Indian River, Florida.....	125	26
Red River, Louisiana, at mouth of.....	9	7
Chicot Pass and Grand Lake, Louisiana.....	70	6
Mississippi River.....	1,943	774
Missouri River.....	386	31
Ohio River.....	968	460
Tennessee River.....	267	36
Illinois River.....	226	41
Great Kanawha River.....	74	33
Sacramento River, California.....	5	1
San Joaquin River, California.....	3	2
Columbia River, Oregon.....	86	39
Willamette River, Oregon.....	10	9
Puget Sound and Washington Sound, Washington.....	205	30
Total.....	4,995	1,674

From this it will be seen that some 5,000 miles on twenty-six rivers were lighted by 1,674 post lights, at an expense of \$280,000, or an average cost of about \$170 per light per year.

Congress during its last session, by the act approved or appropriated for the year which will end on June 30, 1871 pay the expenses of maintaining lights on the twenty-six. Certain of them are in the Eastern States, where the lights is more expensive than in any other part of the additional lights which have already been asked for by the river commerce, and the establishment of which have been recommended by the local light-house officers, make a total of about 1,900 river lights.

The River Commission is now engaged in improving the Missouri River to Kansas City. When this is done it will be required by the increasing steamboat traffic. At present there are no lights on this river above Rochefort, for the reason that the navigation of the Missouri is so dangerous that it is deemed prudent to risk the light-house tender *Lily* in the river.

There is much work which ought to be done by the *Mississippi* in seasons of low water, which it is impossible for the *Lily* to do because of her draught, and which she is unable to do even if there was sufficient water for the expense of keeping her constantly in commission. It is proposed to build a small light draught steam cutter, which would exceed \$5,000, which could be run with a small expenditure which could be handled by a small force of men, to do the work now done by the *Lily*, but which is required in the interest of the commerce not only on the Missouri but also on the Mississippi.

The call for additional river lights during the coming year, comes largely from the east. The Board proposes to meet this demand as far as practicable, as it can thus supply the wants of commerce at a less cost than by building light houses. It is estimated that at 1,900 river or post lights the Board would meet its establishment. But if a few more lights are provided for Eastern rivers, where their cost is only about one-third that at the West, the average of the cost would be reduced. Hence it is recommended that at least \$500,000 be appropriated for the expenses of lighting rivers during the coming year.

ELECTRIC LIGHTED BOOYS.

The feasibility of lighting channels at night by means of electric lights is made clear by the success attained in lighting the Godfrey Channel, leading into the harbor of New York, in an appendix devoted to that subject, in the latter part of this volume. Since the establishment of the booms there have been, however, no severe winter storms. It is quite expensive to mark channels in this manner, considered as a matter of buoyage, but, in this regard,

of lighting a channel, it is one of the most economical measures of the service. Whether or not this method shall be used elsewhere is an economical rather than a practical problem.

THE NEW LIGHT-SHIPS AND LIGHT-HOUSE TENDERS.

The Board is now building five new light-ships and four new light-house tenders. The light-ships Nos. 50, 51, 52, 53, and 54 are intended, respectively, for Columbia River Bar, off the coast of Oregon, Cornfield Point, in Connecticut, on Long Island Sound, Fenwick Island Shoal, off the coast of Maryland, Frying-Pan Shoal, off the coast of North Carolina, and Martins Industry Shoal, off the coast of South Carolina. Each is to embody in herself all needed modern improvements, moving by her own steam, having the best fog signal and having illuminating apparatus specially adapted to the location she is to occupy. The light-house steam tenders *Lilac*, *Columbine*, and *Amaranth* are to go, respectively, to the first light-house district, with headquarters at Portland, Me., the thirteenth light-house district, with headquarters at Portland, Oregon, and the eleventh light-house district, with headquarters at Detroit, Mich. The plans for a new steam tender, the *Maple*, have just been made. She is intended for the fifth light-house district, with headquarters at Baltimore, Md., and she will soon be put under contract. Every effort has been made to embody in these vessels such improvements as will adapt each, in hull and machinery, for its own special work. Attention is invited to an account given in an appendix to this volume, of each of these vessels.

The Board has built, during the past year, three small inexpensive light-vessels, for lake use only during the season of navigation. Each has sufficient steam power for getting to and from her station, and each has a steam fog signal and lights of sufficient range for her location. They are called light-ships Nos. 55, 56, and 57, and it is intended to station them, respectively, on Simmons Reef, White Shoal, and Grays Reef, in Lake Michigan. This experiment of attempting to use inexpensive light-ships instead of costly permanent light-houses is tried at the earnest request of the lake vessel-men. Such small vessels would, however, be entirely inadequate for the boisterous weather and heavy sea of the Atlantic and Pacific coasts of the United States.

TECHNICAL BOOKS FOR THE LIGHT-HOUSE ESTABLISHMENT.

The following recommendation which was made in the Board's last annual report is renewed:

From the organization of the Light-House Establishment until quite recently it has been the practice of the Board to buy such technical and professional books and periodicals as were needed, and to pay for them from the proper general appropriations. This course was taken with the permission of the Secretary of the Treasury, given in many cases previously in writing and with the approbation of the accounting officers of the Department, as shown by their approval of the accounts rendered

therefor by the purchasing officer of the Board. These purchases are now disallowed by the accounting officers.

It has been from the beginning the settled and authorized policy of the Board to maintain a technical library to aid its constructing officers in the performance of their duties. This library now contains more than 3,000 volumes, many costly, most of them rare, and some of them unique, at least in this country. This was found to be the case during the session of the International Marine Conference, when books were borrowed from this library for its use on the plea that they could not be found elsewhere.

Books bought to enable the Board to build a certain light-house or light-ship might be charged against the appropriation for building that structure; but such books, while bought to meet the needs of the Board in each case, are kept to meet all similar cases arising afterwards. Hence they should be paid for from the general rather than from special appropriations. Books thus obtained are placed in the Board's library, which is a lending library, open to all the engineers and inspectors of the sixteen light-house districts. By this method a book bought for one district officer is open to the use of all. This prevents duplication of books and saves much expense.

The Board, in order to keep abreast of the march of science in the highly scientific work for which it is responsible, has great need and makes large use of its library.

An appropriation of \$100 was made for this purpose last year, and it is recommended that the same amount be appropriated for this purpose for use during the coming year.

GAS BUOYS.

The buoy used is of the Pintsch pattern and patent. It is forged by a secret process without seam and holds compressed gas without perceptible loss, which burns with a steady flame and which is rarely extinguished from any cause, making a useful light. The gas buoy is sometimes used to replace, temporarily, a light-ship while the latter is under repair. It is sometimes used where a light-ship can not be moored. A dangerous wreck in an important channel leading into New York had to be marked, and as the channel was too narrow to admit of a light-ship being placed near the wreck, a Pintsch gas buoy was used there satisfactorily, to the great advantage of shipping, for a considerable length of time and until the wreck had disappeared. The Board last year placed a lighted gas buoy in the fairway of vessels going north and south, near to the wrecks of the steamer *Vizcaya* and the schooner *Hargraves*, off Barnegat Light, on the New Jersey sea-coast, where it served to keep vessels from running on to these wrecks. The appropriation of \$30,000 for gas buoys, made by the act approved on March 3, 1891, limited the Board to the payment of not exceeding \$2,000 each, for gas buoys. This provision precluded the purchase of many of the larger class. The size of the buoy, which the Board has used so successfully for the past six or seven years, weighs about 6,000 pounds and costs about \$2,000 on the other side of the Atlantic, where only it is made. The duty upon it is about 45 per cent ad valorem. That amount, with the freight, will make each buoy cost about \$3,000 delivered at the general light-house depot. Ten more of these buoys are

needed. The Board estimates that they will cost \$30,000, and it is recommended that an appropriation of this amount be made for that purpose.

THE PROPER POWER OF RUNNING LIGHTS.

While the International Marine Congress was in session in this city in 1889 the question was raised as to the proper power of the running lights used by vessels of the merchant marine. No agreement could be reached, as the Congress was without accurate knowledge as to intensity of the lights proposed. It had been decided that the side lights of a vessel under way, which should be red on one side and green on the other, ought to be sufficiently powerful to be seen 2 miles, while the white top lights should be seen 5 miles. The Light-House Board was formally requested to ascertain the intensity of the proposed lights by actual experiment. The Board therefore appointed a committee, consisting of two of its inspectors, two of its engineers, with one of its own members as chairman, to do this work. This committee has acted on the matter and its report is presented as an appendix to this volume. Stating the matter in brief, it appears, that to be practically seen in fairly clear weather for 5 miles, a white light must have an intensity of 30-candle power, and that red and green lights to be seen 2 miles must each have a power of forty candles.

ILLUSTRATION OF THE LIGHT-HOUSE LIST.

Mariners have complained that they were unable to determine, from the description in the light-house list, the identity of the light stations by day, when the lights were not burning. The Board has therefore added to the descriptive narration in the light-house list, graphic representation. Cuts of prominent lights in the first and second light-house districts have been added to the last published light-house list. Those stations have been selected which could most readily be mistaken, especially at a distance, for others, and photographs of them were made from the point of view from which mariners would first see them, and from the photographs, the cuts were made. The pictures had to be obtained at small cost, and hence they can have little artistic merit, but they answer the designed purpose so well that the Board is encouraged to add to the next light-house list pictures of prominent lights in other districts. It is claimed that these cuts make the light-houses figured almost as useful to mariners by day as they are by night.

INSPECTING LIGHTS.

The Light-House Board consists of nine persons. Each member is supposed to be an expert in some branch of pharology, and for that reason he is detailed to this duty. His value to the service increases as he comes in personal contact with the local light officers while in perform-

ance of their duty, and this can be accomplished only by sending inspectors to the various districts. The theory is that light-house keepers and engineers inspect the light-houses, light-ships, light-buoys and their appurtenances, and that the members of the Light-House Board inspect the work of the inspectors. In proportion as this theory is carried into effect uniformity of action is insured. Proper inspection by the Board is, however, limited by the fact that their mileage expenses, can be paid only from the \$3,000 appropriation for inspecting lights. Small as this appropriation is, it is the provision that from it must be paid the rewards of information as to collisions and for the apprehension of thieves of damaged light-house property. It is therefore recommended that the amount be increased to \$5,000 for the coming year, or that the Board be authorized to pay its members' mileage or traveling expenses from the several general and special appropriations to which they pertain.

PERSONNEL.

The following changes have taken place in the personnel of the Light House Board since the date of the last annual report.

Upon the death of the Hon. William Windom, Secretary of the Treasury, which occurred January 29, 1891, his successor, Charles Foster, on February 25, 1891, became *ex officio* a member of the Light House Board. On May 29, 1891, Rear-Admiral Day, U. S. Navy, was detached from light-house duty, and on the same date Commodore James A. Greer, U. S. Navy, was ordered to duty. On June 16, 1891, Maj. James F. Gregory, Corps of Engineers, U. S. Army, was temporarily relieved as engineer secretary at the Light House Board of absence with permission to go beyond sea. Capt. Mahan, Corps of Engineers, U. S. Army, and engineer of the light house district, on the same date, and in addition to his regular duties, was detailed for duty, temporarily, as engineer secretary during the absence on leave of Maj. Gregory, and on June 22, 1891, he resumed that duty.

ESTIMATES FOR THE FISCAL YEAR 1892.

Salaries of light houses	...
Repairs of light houses	...
Salaries of keepers of light houses	...
Expenses of light vessels	...
Expenses of buoys	...
Expenses of light ships	...
Inspecting lights	...
Lighting rivers	...
Survey of light houses	...

ESTIMATES FOR SPECIAL APPROPRIATIONS.

Absecon Buoy Depot, New Jersey	\$2,000
Absecon, light-keeper's dwelling, New Jersey	4,000
Alligator River light station, North Carolina	20,000
Assateague, light-keeper's dwelling, Virginia	4,000
Baltimore light and fog-signal station, Maryland	60,000
Barnegat, light-keeper's dwelling, New Jersey	4,000
Bayfield light station, Lake Superior, Wisconsin	5,000
Bay State Shoal and Oak Point Shoal, Lake Ontario, New York, temporary floating lights	800
Beaufort Harbor range lights, North Carolina	10,000
Big Oyster Beds light and fog-signal station, New Jersey	25,000
Black Ledge light and fog-signal station, Connecticut	45,000
Bodega Head light and fog-signal station, California	30,000
Boon Island, keeper's dwelling, Maine	3,400
Buffalo Breakwater fog signal Lake Erie, New York	4,300
Butler Flats light and fog-signal station, Massachusetts	45,000
Cape Elizabeth, keeper's dwelling, Maine	3,300
Cape Fear light station, North Carolina	150,000
Cape Flattery fog signal, Washington	17,000
Cape Hatteras light station, North Carolina (dwelling and oil house)	5,000
Cape May boathouse, New Jersey	800
Cape Meares, Oregon, wagon road, \$5,000	Authority.
Cape Mendocino light station, California, roadway	1,000
Carlton Island light station, Lake Ontario, New York	8,600
Cedar Point light and fog signal station, Maryland	25,000
Cheboygan River (front) range light, Straits of Mackinac, Michigan (additional land)	1,750
Chequamegon Point light and fog signal, Lake Superior, Wisconsin	10,000
Clark Ledge light and fog-signal station, Maine	30,000
Deadman Island light and fog signal, San Pedro Harbor, California	5,000
Depot for the thirteenth light-house district, \$15,000	Authority.
Devils Island, Apostle Group, Lake Superior, Wisconsin (permanent tower)	22,000
Dog River Bar light station, Alabama	20,000
Doboy Sound range lights, Georgia	1,500
Dollers Point and Hog Island Wharf range lights, James River, Virginia ..	2,500
Eagle Harbor fog signal, Lake Superior, Michigan	5,500
Eleven-Foot Shoal light station, Michigan, increase	42,500
Escanaba fog-signal, Lake Michigan, Michigan	1,100
Fairport fog signal, Lake Erie, Ohio	4,700
Forty-Mile Point light and fog-signal station, Lake Huron, Michigan	25,000
Frankfort Pierhead fog signal, Michigan	1,000
Galloo Island fog signal, Lake Ontario, New York	5,700
Gas buoys	50,000
Gladstone light station, Lake Michigan, Michigan	10,000
Grassy Point range lights, Maumee Bay, Lake Erie, Ohio	8,000
Guys Harbor light and fog-signal station, Washington	60,000
Indian Island light station, Maine	12,000
Iron Neck, keeper's dwelling, Maine	3,300
Long Island Shoal light ship, Rhode Island	70,000
Long Island light station, Virginia (to change light from fourth to first order)	125,000
Labrador Inlet light station, Florida	90,000
Little Passage beacon lights, Georgia and Florida	4,000
Little West light station, Florida, increasing height of tower	4,500

Lazaretto Point depot, dwelling for keeper, Maryland	\$2,500
Libby Islands, keeper's dwelling, Maine	3,200
Little Gull Island light and fog-signal station, Michigan	20,000
Little River fog-signal station, Maine	10,500
Ludington fog signal, Lake Michigan, Michigan	5,500
ht station, Michigan, keeper's dwelling	4,500
k, keeper's dwelling, Maine	3,200
signal, Lake Michigan, Wisconsin	500
channel lights, Alabama	60,000
ia light station, Florida	175,000
w South Shoals light ship, Massachusetts	70,000
ugh light and fog-signal station, California	10,000
Cape Disappointment light station, Washington	50,000
North Passage, Mission Point, Mackinac Island, Lake Huron,	15,000
r light stations	15,000
cwater fog signal, Lake Ontario, New York	4,300
r, hire of, for use on the St. Marys River, Michigan	4,000
o light and fog-signal station, California	35,000
light and fog-signal station, California	33,000
at light station, Chesapeake Bay, Maryland	35,000
ght station, California, additional land	2,000
ght and fog-signal station, North Carolina	20,000
Harbor, Michigan, keeper's dwelling	3,500
rts range lights and fog-signal station, Wisconsin	21,000
ierhead fog signal, Lake Erie, Pennsylvania	4,300
post lights, Washington	10,000
light and fog-signal station, California	40,000
ke light and fog-signal station, New York	35,000
ointe steam fog signal, Lake Michigan, Michigan	5,500
bor light station, Connecticut	10,000
land light station, Lake Erie, Ohio	8,600
land fog signal, Michigan	5,500
Ledge, Portland Harbor, Maine, light and fog-signal	45,000
light and fog-signal station, Massachusetts	42,000
l light-house depot, sea-wall, New York	40,000
erty light station, New York Harbor, New York, completing	50,000
i for light-house tender Lily	5,000
Sound light station, Georgia	20,000
erhead fog signal, Lake Michigan, Michigan	5,000
oint light station, Florida	25,000
land light and fog-signal station, Green Bay, Michigan	15,000
and light and fog-signal station, Alaska	80,000
er principal range-lights, Michigan (moving range lights) ...	2,000
age light, Georgia	1,000
y Canal light station, Lake Michigan, Wisconsin	20,000
lights, Lake Superior, Wisconsin	1,200
Bar light and fog-signal station, Maryland	50,000
e ninth light-house district	95,000
nt fog signal, Lake Ontario, New York	4,300
;-signal station, Rhode Island	5,000
or light station, Lake Ontario, New York	2,500
light station, North Carolina	5,000
lights, Oregon	300

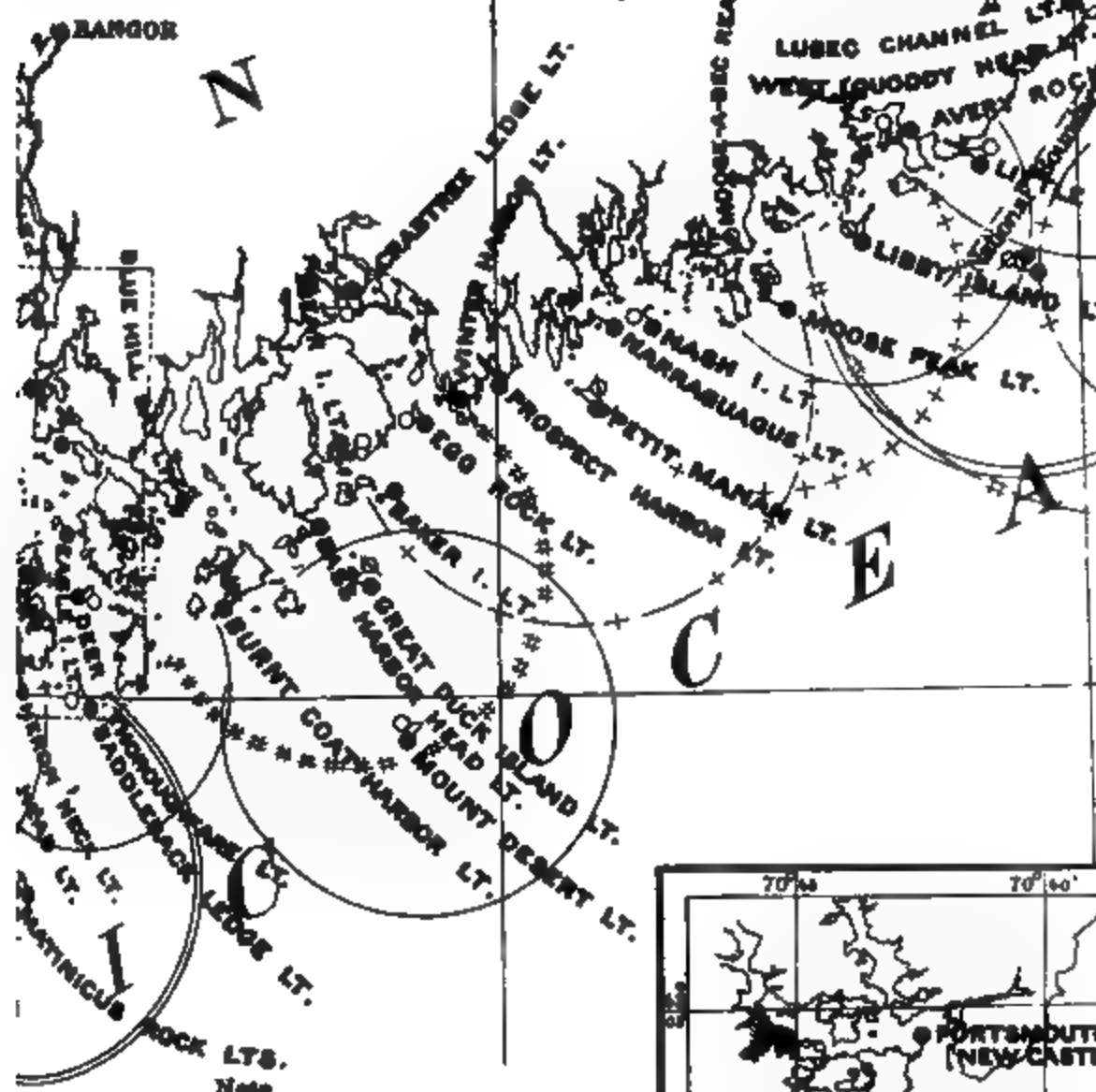
FOR

H. DISTRICT

Statute Miles



Nautical Miles



Note

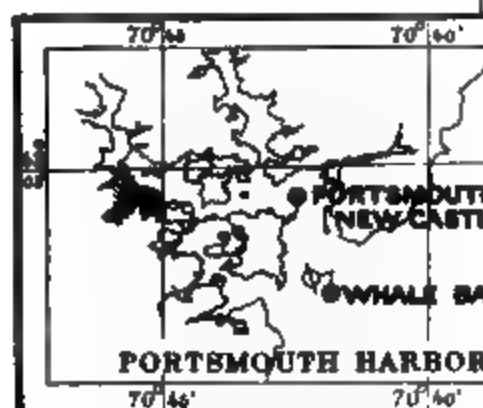
The different varieties of Lights and Day Signals are designated by the following Characters:

- Red Light
- ... Red Light
- ... Flashing White
- ... Flashing Red
- ... Red White varied by White Flash
- ... Red White varied by Red Flash
- ... Red White varied by Red & White Flash
- ... Flashing Red & White
- ... Double Light

- † Light ball
- † Day Signal
- † Light or

The Range of Visibility of the principal Lights

Corrected to



Nautical Miles



40 41 42

FIRST DISTRICT.

The first district extends from the head of navigation in the St. Croix River, Maine, the eastern boundary of the United States, to and including Hampton Harbor, New Hampshire, and includes all the aids to navigation on the coasts and in the navigable bays, rivers, and inlets of Maine and New Hampshire.

Inspector.—Commander Frank Wildes, U. S. Navy.
Engineer.—Maj. William S. Stanton, Corps of Engineers, U. S. Army.
In this district there are—

Light-houses and beacon lights.....	60
Day or unlighted beacons	102
Fog signals operated by steam or hot-air engines	11
Fog signals operated by clockwork	17
Whistling buoys in position.....	11
Bell buoys in position.....	15
Other buoys in position	595
Steamer <i>Iris</i> , buoy tender and for supply and inspection	1
Steamer <i>Myrtle</i> , for construction and repair in the first and second districts	1

The number preceding the name of a light-station is that by which it is designated in the List of Lights and Fog Signals on the Atlantic and Gulf Coasts of the United States, corrected to January 1, 1891, or in the List of Lights and Fog Signals on the Pacific Coast of the United States, corrected to January 1, 1891, or in the List of Lights and Fog Signals of the United States on the Northern Lakes and Rivers, corrected to the opening of navigation, 1891.

LIGHT-HOUSES.

— *Clark Ledge, St. Croix River, near Eastport, Maine.*—The following recommendation, made in the Board’s last two annual reports, is renewed :

Vessels navigating the St. Croix River need a light to guide them to its entrance between the whirlpools off Deer Point and Dog Island, near Eastport. Clark Ledge, near the shore in Eastport Harbor, is almost covered at high water, is very dangerous to navigation, and has caused the loss of several vessels. A light here would serve the twofold purpose of guiding vessels to the entrance of the river and clear of this dangerous ledge. For this purpose an appropriation of \$30,000 is needed. The legislature of Maine, which convenes biennially and will not again assemble until the winter of 1890-’91, has conveyed title to the ledge and jurisdiction over it to the United States, so that the light-house may be erected whenever an appropriation therefor is made by Congress.

It is recommended that an appropriation of \$30,000 be made therefor.

First District.

1, between Quoddy Roads on the south and the harbors port and the St. Croix River on the north, Maine.—The setting of a cylindrical iron caisson, 53 feet in diameter high, built upon a pile subfoundation 17 feet below mean low water, and surmounted by an iron tower 37 feet above the focal plane, was finished on November 5, 1890. The light, of the fifth order, is flashing white every fifteen seconds, above the fire horizon, and was first exhibited on December 31, 1890. It was provided with a 1,200-pound bell struck by

mouth of Little River, Cutler Harbor, Maine.—The lighthouse foundation, which was made in the Board's last two years, was renewed:

station of the Eastport, St. John, and Bay of Fundy pilots. It is a summer resort. Vessels making the Bay of Fundy first make an attempt to make Little River light. Steamers of the International Harbors are a harbor and stopping place. They carry much freight and passengers, and is the only near harbor of refuge, and is used as such by vessels in; but this is impossible in a fog, without the aid of a fog signal. The steamer *Eduardo* struck at low tide on July 21, 1889, on Old Man, south of Cutler Harbor, at midnight and during a dense fog, and proved a total loss. The crew, numbering 40 men in all, numbered 2,308 tons and cost \$285,000. The inspector of the first made a report relating to this wreck, from which the following

1, arrived near Libby Island light and fog-signal station on July 20, and remained in that vicinity until near midnight, occasionally seaward and then returning, apparently keeping between the Island and Seal Island.

The weather was calm, with a rough sea and dense fog. About 9 p. m. it scaled the Old Man and Moose Peak lights were visible, and soon after the vessel was bound north at slow speed, with frequent casts of the lead.

At 10 p. m. fog being very thick, the vessel struck on Old Man, having the automatic fog bell of Little River light-station, 2½ miles distant to the north, and the whistling buoy off same place 3½ miles distant, bearing about

of the chart it will be seen that Little River and Harbor opens to the north, and that the high land of Little River Head covers the light-station from about north. A steam fog-signal at the light-station might be heard near the Old Man; it would not be heard certainly at its full power from Little River Head it would be exposed in all directions seaward. In this case, without any doubt, have been the greatest possible chance for the *Eduardo* to that point; the whistling buoy could then have been heard, a fresh departure taken, or the vessel could have entered the

An extract from the report of her master of the wreck of the

point of Little River there had been a fog whistle or trumpet, doubt would not have occurred, so that, in my opinion, it is absolutely certain that at that point some fog signal operated by steam

First District.

The Board is also of opinion that this wreck would not have occurred had the fog signal now recommended for Little River light-station then been in operation. It is estimated that the establishment of such a signal would cost \$10,500, and the appropriation of that amount is therefore recommended.

5. *Avery Rock, on Avery Rock in Machias Bay, Maine.*—A boathouse was built to replace the boathouse carried away by the storm of 11-12 January, 1891; the boat-slip was extended to it, 500 square feet of platform of heavy timbers securely bolted to the ledge were laid in front of

First District.

the dwelling in place of a concrete platform much damaged by the sea, the exposed corners of the dwelling were protected from the sea by heavy yellow-pine timbers bolted to the ledge, and minor repairs were made to the dwelling. A bell tower of yellow-pine timbers 10 inches square was erected on a more favorable site on the southeast of the dwelling and securely bolted to the ledge; the striking machine, which was thoroughly overhauled and repaired, and the bell were set up in the new tower, which was connected with the dwelling by a covered way of heavy timber.

6. *Libby Islands, entrance to Machias Bay, Maine.*—The fog-signal house was provided with brick ash-pits and coal bunkers to permit the Daboll trumpet and caloric engines to be replaced by steam fog whistles with apparatus in duplicate. A rain shed, 40 feet by 140 feet in plan, and a storage cistern and service, respectively of 32,000 and 12,000 gallons' capacity, were built. The steam fog-signal apparatus in duplicate was built in the machine shop in Boston, and a 1,000-pound bell was provided to be rung by hand in emergency. Minor repairs were made to the tower and boat-slip.

Since the establishment here of the fog signal by Daboll trumpet, about nine years ago, made the appointment of an assistant keeper necessary, the assistant has been intimately related to the principal keeper. For several years he was the brother of the keeper's wife, and thereafter and until now the keeper's son-in-law was assistant keeper, and the families of the principal keeper and his assistant have lived together as one family in one dwelling. Recently the principal keeper has resigned; the families of the keeper and his assistant, therefore, must live separately hereafter. The only dwelling at the station is adapted, neither in size nor arrangement, to two families, and another set of quarters has therefore, become urgently necessary. The substitution this summer of the steam fog signal for the Daboll trumpet will make it more than ever necessary and important to have an efficient assistant, and the provision of a suitable set of quarters for him will make it much easier for the service to obtain and retain an assistant of the qualifications required. It is estimated that an additional keeper and dwelling can be built for \$8,200, and it is recommended that an appropriation of \$8,200 be made therefor.

7. *Point of View, entrance to Bay of Fundy, Maine.*—The reservation here, where the reservation was fenced, one end of the reservation was removed, and other minor repairs were made.

8. *Point of View, entrance to Moose-a-bee Bay, Maine.*—A raised walk was set in a mass of concrete down to the water from the beach for a tubular lantern. The lantern was placed on the walk in July, 1891.

9. *Point of View, entrance to Bay of Fundy, Maine.*—A fuel house and close board walk were built between the dwelling and double fuel house

First District.

were reshingled, four windows in the tower were renewed, 150 feet of plank walk were laid, the boat-slip was partially renewed, and minor repairs were made to both dwellings and to the tower. The interior of the fog-signal house was remodeled to receive larger boilers and to permit the reversal of the position of the boilers and machinery.

11. *Prospect Harbor, entrance to Prospect Harbor, Maine.*—The buildings are old and dilapidated. They will be rebuilt during the ensuing fiscal year.

12. *Winter Harbor, on Mark Island, Maine.*—The boat-slip was partly renewed and minor repairs were made to the dwelling.

13. *Mount Desert, on Mount Desert Rock, Atlantic Ocean, some 27 miles from the coast of Maine.*—The boat-slip, 150 feet in length, was rebuilt and provided with a third rail, making a double slip; one end of the frame dwelling was partly renewed and minor repairs were made to the dwelling, boathouse, and outbuildings.

15. *Crabtree Ledge, between Bar Harbor and Mount Desert Ferry, Frenchman Bay, Maine.*—A 1,200-pound bell, struck by machinery, with a bell house of sheet iron, was placed upon the pier. Various minor repairs were made.

17. *Great Duck Island, about 11 miles south from the entrance to Frenchman Bay, Maine.*—This station was commenced in May and finished in December, 1890. It consists of a brick tower 35 feet high to its focal plane, with a brick service room 8 feet by 10 feet in plan; a brick fog-signal house 32 feet square, with a service cistern holding 25,000 gallons; a rain-shed 130 by 30 feet in plan, with a storage cistern holding 5,350 gallons, and with coal bunkers of 60 tons' capacity; three dwellings of six rooms each, with outbuildings, a barn 20 feet by 30 feet in plan, a boat and store house at the landing measuring 30 feet by 40 feet, a double boat-slip 200 feet long, and an enginehouse with steam windlass. The steam fog-signal apparatus, complete in duplicate, was installed and the light was first exhibited December 31, 1890, on which date the fog signal was also ready for service. A 1,200-pound fog bell was provided to be rung by hand in emergency.

— *Green Island, entrance to Burnt Coat Harbor, Maine.*—The following recommendation, made in the Board's estimates and reports for the last six years is repeated:

Burnt Coat Harbor is an excellent, capacious harbor of refuge. The range lights which guided to the entrance were unsatisfactory, and a vessel was wrecked last year while trying to make the harbor by their aid. One of them was accordingly discontinued, and it is proposed to erect in its stead a light-house on Green Island, about a mile to the southward of the entrance. It is recommended that an appropriation of \$12,000 be made therefor.

22. *Saddleback Ledge, entrance to Isle au Haut Bay, Maine.*—The boat-slip was extended 90 feet and an iron ladder was attached to the bell tower.

First District.

23. *Heron Neck, on Green Island, East Penobscot Bay, Maine.*—The keeper's dwelling, built when the station was established in 1853, was designed to be an excellent one, having 8-inch brick walls separated by a 2-inch air space from a 4-inch brick lining and having interior 4-inch brick partitions. It is, however, understood to have been built by contract, and so little mortar was used that many of the joints do not appear to have been filled. In driving rainstorms they receive large quantities of water which keep the walls very damp and almost incessantly exudes moisture into the dwelling. The dampness of the dwelling is further increased by the character of the site, which is underlaid by a sloping ledge over which the water flows, saturating the soil surrounding the dwelling and keeping its cellar wet. From these causes the dwelling is unhealthy and it is unsuitable for occupancy in so severe a climate. It is claimed that on this account five deaths have occurred in it since its erection in 1853. It would cost, to remedy these radical defects in the walls and of the site, almost if not quite as much as it would to erect a new building on a proper site. A new building on a better site it is estimated would cost \$3,300, and it is recommended that an appropriation of this amount be made for that purpose. Minor repairs were made.

25. *Goose Rocks, easterly entrance to Fox Island Thoroughfare, Maine.*—The light-house was commenced May 7 and finished November 14, 1890. It consists of a cylindrical iron caisson 25 feet in diameter and 24 feet in height, founded upon a ledge of rock awash at about half tide, filled with concrete and surmounted by an iron tower, 37 feet high from base to focal plane. The light is of the fifth order, is fixed red with a fixed white sector, illuminates the entire horizon, and was first exhibited on December 31, 1890. The station was provided with a 1,200-pound bell, struck by machinery.

28, 29. *Matineus Rock, entrance to Penobscot Bay, Maine.*—The single boat slip was converted into a double one and minor repairs were made to the dwelling, tower, and boat-slip. For more than twenty years, and until recently, the first assistant keeper was the son of the principal keeper and the two lived together in one dwelling. The resignation of the principal keeper has broken up this arrangement. At this important station, which has two second-order lights and a steam fog signal, a keeper and three assistant keepers are employed. These are the only people living on this rock. Two of the assistant keepers, with their families, live in one double dwelling and the principal keeper lives in a separate single dwelling. These three sets of quarters are adapted only to the accommodation of three families and a fourth set of quarters is therefore urgently necessary for the third assistant. It is estimated that a proper dwelling can be built for \$2,200 and recommendation is made that this amount be appropriated for that purpose.

This little rocky islet is about half a mile long and of irregular width,

First District.

nowhere exceeding an eighth of a mile, and the highest part is not more than 50 feet above the sea level. There is a little cove where material can be hauled up in pleasant weather, but it has no harbor. The light-house keeper effects a landing by steering his boat through the breakers on the top of a wave, so that it will land on the boatways, where his assistants stand ready to receive him and draw his boat so far up on the ways that a receding wave can not carry it back to the sea. There is neither tree nor shrub and hardly a blade of grass on the rock. The surface is rough and irregular and resembles in a large way a confused pile of loose stone. Portions of the rock are frequently swept by the waves which move the huge boulders into new positions. During the storm of January 19, 1856, the sea made a complete breach over the rock, washing away every movable thing. The old dwelling was so thoroughly demolished that not one stone was left upon another. The then new dwelling, though situated in the most protected spot, was flooded and heavy wooden shutters had to be closed to prevent the violence of the spray from breaking them in. The rock is about 20 miles from the mainland, as the crow flies. Rockland, 25 miles distant, is the nearest harbor, unless the coves of Matinicus Island, 4 miles from the rock, be considered as harbors. They can be entered only with certain winds by vessels of very light draught. The isolation of this station and the difficulty of landing material here of course enhance the cost of erecting the proposed structure, in which strength rather than the graces of architecture are most considered.

30. *Whitehead, westerly entrance to Penobscot Bay, Maine.*—The old rubble-stone dwelling was demolished and replaced upon the same foundation by a framed double dwelling, 27 by 37 feet in plan, with an L measuring 27 by 16 feet, with suitable outbuildings. A brick service room, measuring 12 by 16 feet, was annexed to the tower, and an oil house, 9 feet 4 inches by 11 feet 8 inches, was built. The grounds about the dwelling were extensively filled and graded, and a steam pump and inspirator was provided for the fog signal, which was thoroughly overhauled and repaired. Various repairs were made to the depot, wharf, and coal shed.

33. *Browns Head, westerly entrance to Fox Island Thoroughfare, Maine.*—The station was provided with a new fuel house, 12 by 20 feet in plan, a brick cistern holding 2,000 gallons, and a new kitchen floor. An embankment with a retaining wall 40 feet long by 6 feet high was built in front of the dwelling, and minor repairs were made.

36. *Grindel Point, entrance to Gilkey Harbor, Maine.*—The question of the location of the boundary line of the light-house land arising from a manifest error in the deed, which was on February 7, 1889, referred to the United States attorney for settlement, will speedily be adjusted, and the boundary fence will be built during the ensuing fiscal year.

37. *Dice Head, entrance to Castine Harbor, Maine.*—Three sides of

First District.

the tower were resingled, its lead flashing was renewed, and a 1,000-pound bell was provided and hung, to be rung by hand in answer to signals.

38. *Fort Point, mouth of Penobscot River, Maine.*—A 1,200-pound bell, struck by machinery, was provided, and minor repairs were made to the dwelling and tower.

40. *Marshall Point, entrance to St. George Harbor, Maine.*—The barn, 18 by 25 feet in plan, and a fuel house, measuring 15 by 25 feet, were rebuilt, and the latter was connected with the stone dwelling by cutting a door through the wall.

42. *Manana Island Fog-signal Station, coast of Maine.*—Both engines connected with the fog signal were thoroughly overhauled and repaired.

44. *Pemaquid Point, entrance to Muscongus Bay, Maine.*—The question of the location of the boundary line of the light-house land at this station, which was referred to the United States attorney for settlement on March 8, 1889, is not yet adjusted.

45. *Ram Island, entrance to Boothbay Harbor, Maine.*—The boat-slip was lowered and extended 12 feet seaward, and an iron ladder was provided at the landing.

47. *Hendricks Head, entrance to Sheepscot River, Maine.*—A bell house upon a pyramidal skeleton frame of yellow pine bolted to the ledge was built and a 1,200-pound bell, struck by machinery, was provided and put in place.

51, 52. *Cape Elizabeth, Maine.*—Until the resignation of the principal keeper, about two years ago, his wife was an assistant keeper, so that there were but three families to be accommodated in the three single dwellings at this station. This arrangement is changed, and there are now four separate families at the station, and two families are crowded into a dwelling adapted in size and arrangement to only one family. The two towers are more than 900 feet apart; two of the dwellings are near the northeast and one near the southwest tower. A fourth dwelling is very urgently needed near the latter to properly and conveniently house in the severe winter weather of that climate the second of the two assistants who attends the light in it. Besides a first and a second order light, the station has a first-class fog signal, and an additional dwelling is imperatively needed in the best interests of the service. It is estimated that one can be built for \$3,300, and it is recommended that an appropriation of this amount be made therefor. Some repairs were made.

54. *Noised Head, entrance to Portland Harbor, Maine.*—The old stone dwelling was demolished, and a framed double dwelling, 42 feet 6 inches by 17 feet in plan, was built upon the same foundation, and a brick oil house 8 feet 6 inches square, a flight of steps at the landing, 30 feet in length, were built. The watch room and dwellings were connected by speaking tubes, and minor repairs were made to the service room.

First District.

Both of the engines belonging to the fog signal were overhauled and repaired.

— *Spring Point Ledge, Portland Harbor, Maine.*—A bell should be placed on Spring Point Ledge, Portland Harbor, at a point where it would mark that dangerous ledge, which lies in bold water at the edge of the channel. It would also mark a turning-point, and would be of great service to vessels making their way into Portland Harbor in thick weather, going either to the wharves, to an anchorage in Diamond Island Roads, or to the westward of Fort Gorges. At present they have to grope their way unaided after leaving the bell buoy off Cushing Island Point. When the sea is exceptionally calm this buoy does not ring, and there is no guide for vessels from the time they pass the trumpet at Portland Head. With a bell on Spring Point Ledge, vessels could always change their course there in thick weather, without depending, as they now do, on their time from the bell buoy or from Portland Head, 2 miles distant. The difficulty is increased by the liability of the reckoning being lost in meeting other vessels which throng the harbor, and some of which even anchor in the channel in the midsummer season, when the fogs are most dense and frequent.

The peril to vessels in thick weather is also somewhat increased by the tendency of a current, issuing at some states of the tide between Cushing (Bangs) Island and Fort Scammel, to set vessels toward the Spring Point side of the channel, and of the ebb current to set them in a southerly direction on to Spring Point Ledge.

Seven steamship companies own steamers which enter Portland Harbor. They embrace the regular coastwise lines, one foreign line, and the steamers plying between Portland and places in the immediate vicinity which are of daily resort in summer. These companies claim that 518,362 passengers were carried into Portland by their steamers last year, as follows:

Casco Bay Company.....	317, 285
Portland Steam Packet Company.....	75, 482
International Steamship Company.....	40, 325
Maine Steamship Company.....	4, 495
Harpwell Steamboat Company	6, 000
Portland and Boothbay Steamboat Company.....	3, 000
Steamer Greenwood	36, 000
Steamer S. E. Spring.....	35, 000
Allan Steamship Line	775
Total	518, 362

In view of the excellence and importance of the harbor, the very large number of vessels which annually resort to it for refuge, the great number of passengers carried into it, which will doubtless steadily increase with the increasing number of people who resort to the coast of Maine in midsummer, and the frequency and density of the fogs at the very

First District.

period when the passenger traffic is greatest, it is recommended that provision be made for the establishment upon Spring Point Ledge of a fog bell and a light of the fifth order, in a depth of water not to exceed 12 feet at mean low tide, and the building of a structure of about the type and diameter of those at Crabtree Ledge and Goose Rocks, Maine. It is estimated that this can be done for \$45,000, and it is recommended that an appropriation of this amount be made for that purpose.

58. *Boon Island, seacoast of Maine.*—There are at this station one keeper and two assistants, and but two sets of quarters in one double dwelling. The second assistant keeper has to board either with the family of the keeper or with that of the first assistant keeper. This forced arrangement is unsatisfactory to all, and is quite unfavorable to the retention of a second assistant of the needed qualifications. The station is isolated and exposed, the tower is tall, and this second-order light is an important one. A third dwelling, which is urgently needed, it is estimated can be built for \$3,400. It is therefore recommended that an appropriation of this amount be made therefor.

REPAIRS.

At each of the following-named stations repairs and renovations, more or less extensive, were made during the year:

- | | |
|---------------------------------|-------------------------------------|
| 3. West Quoddy Head, Maine. | 43. Franklin Island, Maine. |
| 14. Egg Rock, Maine. | 48. Pond Island, Maine. |
| 16. Baker Island, Maine. | 49. Seguin, Maine. |
| 20. Burnt Coat Harbor, Maine. | 50. Half-Way Rock, Maine. |
| 21. Blue Hill Bay, Maine. | 52. Cape Elizabeth, Maine. |
| 22. Rockland Breakwater, Maine. | 54. Portland Breakwater, Maine. |
| 25. Negro Island, Maine. | 55. Wood Island, Maine. |
| 30. Penikese Harbor, Maine. | 56. Goat Island, Maine. |
| 41. Monhegan Island, Maine. | 61. Isles of Shoals, New Hampshire. |

SURVEYS.

The light house lands were surveyed, their boundaries were marked with stone posts or copper bolts, contours were located by plane table, and buildings were measured for ground plans at the following-named stations:

- | | |
|------------------------|------------------------|
| 1. Moose Neck. | 20. Burnt Coat Harbor. |
| 16. Great Duck Island. | 30. Whitehead. |
| 18. Bear Island. | 40. Marshall Point. |

Plots of the light house land, showing in detail the contours and buildings, with separate plots of the buildings on a larger scale, were made at the following named stations:

- | | |
|------------------------|-------------------------|
| 1. Moose Neck. | 30. Whitehead. |
| 16. Great Duck Island. | 40. Marshall Point. |
| 18. Bear Island. | 51. 52. Cape Elizabeth. |
| 20. Burnt Coat Harbor. | |

First District.**DAY OR UNLIGHTED BEACONS.**

Jordans Delight Ledge, entrance to Narraguagus Bay, Maine.—Contract was made on November 24, 1890, for removing the stump of the spindle from this ledge, enlarging the hole, and setting a 10-inch forged-iron spindle therein. This work has not yet been done.

Channel Rock, Fox Island Thoroughfare, Maine.—A tripod of the usual pattern, surmounted by a spindle with a cask, was erected upon this ledge.

Ask Island beacon, Muscle Ridge Channel, Maine.—The screw bands securing this tripod to the ledge were in great part renewed.

Fishing Rocks, mouth of Saco River, Maine.—The iron day-mark surmounting this spindle was renewed.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

3. *West Quoddy Head, Maine.*—This 10-inch steam whistle in duplicate was in operation 1,433 hours during the year, and consumed about 61 tons of coal.

6. *Libby Islands, Maine.*—This third-class Daboll trumpet in duplicate was in operation 1,665 hours, and consumed $4\frac{1}{2}$ tons of coal.*

10. *Petit Manan, Maine.*—This 10-inch steam whistle in duplicate was in operation 1,669 hours, and consumed about 51 tons of coal.

17. *Great Duck Island, Maine.*—This 10-inch steam whistle in duplicate was in operation 473 hours, and consumed about 18 tons of coal. It went into service in January, 1891.

28, 29. *Matinicus Rock, Maine.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation 1,000 hours, and consumed $43\frac{1}{4}$ tons of coal.

30. *Whitehead, Maine.*—The 10-inch steam whistle in duplicate was in operation 2,243 hours, and consumed about 65 tons of coal.

42. *Manana Island, Maine.*—This first-class Daboll trumpet in duplicate was in operation 702 hours, and consumed $10\frac{1}{2}$ tons of coal.

49. *Seguin, Maine.*—The 10-inch steam whistle in duplicate was in operation 944 hours, and consumed $40\frac{1}{4}$ tons of coal.

51, 52. *Cape Elizabeth, Maine.*—This signal, consisting of one second-class steam siren and one 12-inch steam whistle, was in operation 727 hours, and consumed about 32 tons of coal.

53. *Portland Head, Maine.*—This second-class Daboll trumpet in duplicate was in operation 881 hours, and consumed $9\frac{5}{8}$ tons of coal.

59. *Whaleback, New Hampshire.*—This third-class Daboll trumpet in duplicate was in operation 832 hours, and consumed 4 tons of coal.

BUOYAGE.

The buoyage of this district is in good condition.

* A steam whistle was substituted for the Daboll trumpet on August 15, 1891.

First District.**DEPOTS.**

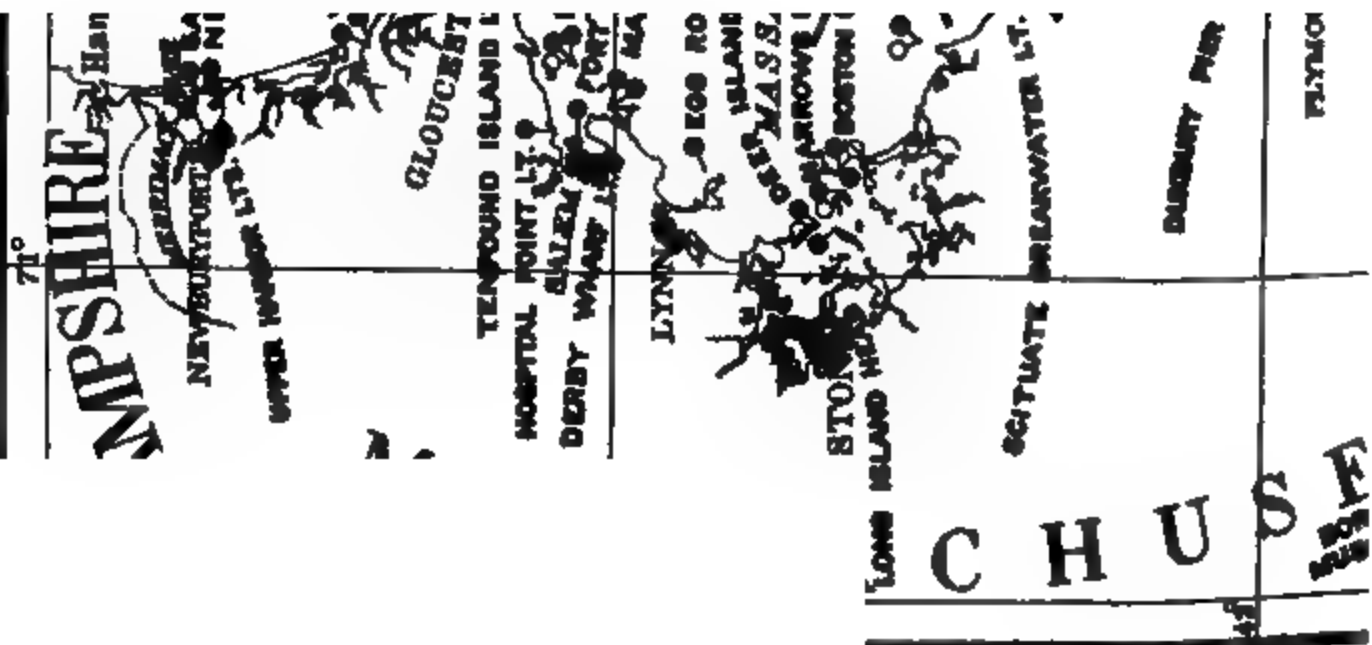
Little Diamond (Hog) Island, Portland Harbor, Maine.—There is not sufficient room here for material and work. It is proposed that the re-entering angle at the southeast corner be filled out square when funds are provided for the purpose. This will give ample room and more frontage.

Whitehead, Maine.—On January 11, 1891, an unusually high tide and storm floated the superstructure of the bridge from its foundations. The bridge was substantially rebuilt and the shed was repaired.

Bear Island, Mount Desert, Maine.—When funds will permit, it is proposed to widen the pier by an addition on the north side, as there is not now sufficient room for material and labor. Bell and whistling buoys and mooring stones now have to be kept on the end of the pier, filling it up.

TENDER.

The Iris.—This steamer was laid up twenty-one days for repair. She steamed 15,630 miles, consuming in so doing 544 tons of coal. She replaced 111 buoys, changed 97 buoys, painted 538 buoys, painted 6 spindles, made and ironed 60 buoys, landed 396 tons of coal at light-stations, and did thirty-one days' work at the buoy depot. She was placed on the railway in November, when her metal was stripped off and her bottom was calked and painted, her stem was repaired, and two strakes of copper were put on at the water line. In March the spar deck was calked, new sills were put in the working ports and small repairs were made to the boiler and engine. These repairs will probably keep the vessel in service until the new tender, now under construction, is completed.



SECOND DISTRICT.

The second district extends from Hampton Harbor, New Hampshire, to, but does not include, Elisha Ledge, off Warren Point, Rhode Island, and embraces all the aids to navigation on the coast of Massachusetts except a small portion of Narragansett Bay and Taunton River.

Inspector.—Commander George F. F. Wilde, U. S. Navy.

Engineer.—Maj. William S. Stanton, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights	70
Light-ships in position	9
Light-ships for relief	2
Day or unlighted beacons.....	69
Fog signals operated by steam or hot-air engines.....	7
Fog signals operated by clockwork	10
Lighted buoys in position (gas)	1
Whistling buoys in position.....	9
Bell buoys in position	13
Other buoys in position.....	482
Ice buoys for winter use	9
Steamers <i>Verbena</i> , <i>Geranium</i> , and <i>Azalea</i> , buoy tenders and for supply and inspection	3
Steamer <i>Myrtle</i> , for construction and repair in the first and second districts....	1

LIGHT-HOUSES.

62, 63. *Salisbury Beach, mouth of Merrimac River, Massachusetts.*—In consequence of the shifting of the channel two tubular lanterns, suspended from spars, were set on the beach to serve as a range in guiding vessels across the bar instead of the range lights formerly on Plum Island. Hence these range lights misled rather than guided vessels through the channel across the bar at the mouth of the Merrimac River. The front beacon was therefore extinguished, and its illuminating apparatus was sent to the general light-house depot.

64. *Newburyport Harbor, entrance to Merrimac River, Massachusetts.*—The question of the extent and boundaries of the light-house land here has long been in dispute, and the action of the Department of Justice in the matter has been awaited since January, 1888.

78. *Fort Pickering, on Winter Island, Salem Harbor, Massachusetts.*—The barn, 20 by 22 feet in plan, was rebuilt, and a brick cistern was provided for the dwelling.

Second District.

84. *Boston, entrance to Boston Harbor, Massachusetts.*—A new revolving machine for the lens was made in the machine shop in Boston, the trucks and facings for the lens were renewed, and various repairs were made. The engine for driving the siren fog signal was thoroughly overhauled and renovated in the Board's machine shop in Boston and restored at the station.

86. *The Narrows, entrance to The Narrows Channel, Boston Harbor, Massachusetts.*—The gallery around the dwelling was widened and was rebuilt, with the fuel and other outhouses upon it. It was also provided with an iron railing, new outer stairs were made, and the ice breaker was repaired.

87. *Deer Island, entrance to Boston Harbor, Massachusetts.*—A window in the pier, which was stove in by the sea, was replaced by a 15-inch ship's side light, and a globe ventilator was fitted on the smokepipe to increase the draft. A 1,200-pound bell, with striking machine, was placed at the station for temporary service until the installation of the Daboll trumpet.

— *State Ledge, Boston Harbor, Massachusetts.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

The ship channel, from the Boston Wharves to Nixs Mate buoy, has no aids to navigation except buoys. Vessels find it very difficult in thick weather and at night to keep in the channel, and they are particularly perplexed to know just where to turn in the neighborhood of State Ledge and Buoy No. 8, both in leaving and entering the harbor. Large excursion steamers, as well as steamers of the regular lines running out of Boston, frequently have to anchor in thick weather solely because they have no guide between Nixs Mate buoy and the wharves. This greatly incommodes business men going and coming during the summer months when fogs are prevalent. The Board has recognized for a long time the necessity for a light and fog signal at this point, but has postponed action while the improvements in the channel of the harbor in charge of the United States Engineers were in progress. Although these improvements have not yet been entirely finished they are practically concluded in that vicinity, and the Board is of opinion that the time has arrived when a light and fog signal ought to be established near Buoy No. 8, or at or near State Ledge. It is estimated that it will cost \$42,000 to establish a light and fog signal at this point.

It is recommended that an appropriation of this amount be made therefor.

89. *Scituate Breakwater, entrance to Scituate Harbor, Massachusetts.*—A spar was erected near the outer end of the breakwater for supporting an eight-day ruby lantern, and on June 10, 1891, the light was first exhibited.

93. *Race Point, northwesterly point of Cape Cod, Massachusetts.*—A new boiler was provided connected with the fog signal and covered with felt and canvas.

97. *Billingsgate Island, entrance to Wellfleet Bay, Massachusetts.*—The plank bulkhead and jetties of brush and stone, built in 1888 to arrest the

Second District.

rapid encroachment of the sea upon the light-house site, which threatened to soon reach the structure itself, were exceptionally efficacious, and the entire works are now buried in the sand which they have accumulated.

98. *Sandy Neck, entrance to Barnstable Harbor, Massachusetts.*—The bulkhead, 71 feet long, was rebuilt for the protection of the site against the sea, an outside cellarway was made, and minor repairs were made to the dwelling, tower, service room, and walks.

99. *Cape Cod, on the northeast side of Cape Cod, Massachusetts.*—The dwelling in its clapboarding, masonry, plastering, interior joiner work, shingling, and lead flashing was quite severely and extensively damaged by lightning on February 28, 1891, and was immediately repaired. A brick oil house, 12 by 13 feet in plan, was built and various minor repairs were made.

106. *Monomoy Point, southern extremity of Cape Cod, Massachusetts.*—The pipe well, 25 feet deep, was renewed.

119. *Bishop and Clerks, on a submarine site in Nantucket Sound, Massachusetts.*—An iron crane for hoisting the boat and supplies was renewed.

127. *West Chop, entrance to Vineyard Haven Harbor, Massachusetts.*—Some dwellings recently erected in the vicinity of this station obscured the light over a part of Vineyard Sound. To remedy this a lens lantern was provided and attached to an iron mast, 17 feet high, erected upon the lantern deck. The tower itself, of rubble masonry, covered with shingles, is in poor condition, and will be rebuilt during the ensuing fiscal year.

129. *Tarpaulin Cove, on Naushon Island, Vineyard Sound, Massachusetts.*—The old tower of rubble masonry, built in 1817, was demolished and a brick tower, 28 feet high, with iron stairs, iron deck, and a new fourth-order lantern complete, was built upon the same foundation. The station was provided with a 1,200-pound bell, struck by machinery.

— *Butler Flats, New Bedford Harbor, Buzzards Bay, Massachusetts.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

The entrance near buoy No. 9, on the point of Butler Flats, is narrow, obscure, and difficult to find in snowstorms, fogs, and dark nights. If a light with a fog signal was placed on that point it would mark both the entrance and turning-point; would guide vessels to an anchorage in the lower harbor, and, with the light on Palmer Island, would guide them clear of North Ledge, Henrietta and Hurricane Rocks, in Buzzards Bay, and be of great service to the navigation of this important port. It is stated by the custom-house authorities that 1,814 vessels entered the port of New Bedford during 1887, not including yachts, fishing craft, or boats. It is also stated that the Vineyard Sound and Nantucket steamers took 75,000 passengers to and from this port and received \$22,500 for freight carried. It is further stated that the New York propellers made 104 trips between New York and New Bedford, and received over \$100,000 for freight carried. New Bedford is now said to be the third

Second District.

manufacturing city in Massachusetts, and the collector of the port states that about 500,000 tons of shipping came into the port during last year.

The Board, as stated in its last annual report, is of the opinion that the needs of commerce and navigation require the establishment of a light and fog signal at this point. It is estimated that they can be erected for \$45,000, and it is recommended that an appropriation of this amount be made therefor.

REPAIRS.

At each of the following-named stations repairs of greater or less extent were made during the year:

65, 66. Newburyport, Upper Harbor, Massachusetts.	83. Minots Ledge, Massachusetts.
67, 68. Ipswich, Massachusetts.	85. Boston Auxiliary, Massachusetts.
70. Straitsmouth, Massachusetts.	88. Long Island Head, Massachusetts.
71, 72. Cape Ann, Massachusetts.	92. Duxbury Pier, Massachusetts.
73. Eastern Point, Massachusetts.	94. Wood End, Massachusetts.
74. Tenpound Island, Massachusetts.	95. Long Point, Massachusetts.
75, 76. Baker Island, Massachusetts.	96. Mayo Beach, Massachusetts.
77. Hospital Point, Massachusetts.	100-102. Nauset Beach Beacons, Massachusetts.
79. Derby Wharf, Massachusetts.	111. Sankaty Head, Massachusetts.
80, 81. Marblehead, Massachusetts.	135. Palmer Island, Massachusetts.

SURVEYS.

Plots of the light-house land, showing in detail the contours and buildings, with separate plots of the buildings on a larger scale, were made for the following stations:

- 127. West Chop, Massachusetts.
- 129. Tarpaulin Cove, Massachusetts.
- 139. Wings Neck, Massachusetts.

LIGHT-SHIPS.

105. *Pollock Rip Light-Vessel, No. 42, off Chatham, Cape Cod, Massachusetts.*—On May 19, 1891, she was towed to New Bedford, where her boilers were repaired, her decks were calked, a boat was repaired, a new set of sails was supplied, stoves for the cabin and the galley were put in, the tanks were cemented, the medicine chest was replenished, and other necessary articles were furnished. She was towed on June 30, 1891, to Hyannis on her way to her station, when light-ship No. 47, which had been on the station while repairs were being made to this ship, was brought in.

107. *Shovelful Shoal Light-Vessel, No. 3, off Monomoy Point, Cape Cod, Massachusetts.*—The boat was repaired, a rope for the chain stopper and new hose were supplied.

108. *Handkerchief Light-Vessel, No. 4, Nantucket Sound, Massachusetts.*—The bell was repaired and blocks, rubber hose, boat sail, etc., were furnished. In September 1890, she was run into and received some slight damage, which was repaired by the keeper.

Second District.

109. *Great Round Shoal Light-Vessel, No. 9, off Nantucket, Massachusetts.*—Upon the petition of the Boston Board of Commerce, relief light-ship, No. 9, was placed on this station on October 10, 1890, to remain until she should be replaced by the new light-ship, No. 47, then being built. In the latter part of May the new ship, No. 47, was completed, but as relief light-ship, No. 39, was on the Vineyard Sound Station, and it was necessary to bring in Pollock Rip ship for repairs, No. 47 was placed on Pollock Rip, where she remained during the rest of the fiscal year.*

112. *Nantucket New South Shoal Light-Vessel, No. 1, off Nantucket, Massachusetts.*—She broke adrift from her station on June 27, 1890, and on July 7 was replaced. The medicine chest was replenished, and blocks and rope were supplied.

This vessel was built in 1855, and, although thoroughly repaired in 1880, she is no longer of proper strength to be moored in the most exposed and most inaccessible station on our coasts. Besides this, the vessel on this station should have a steam fog signal, and she has none, and none can be put into her owing to her build. Time and again her master has seen a vessel standing directly into danger, and been unable to signal to her in any way except by flag, which failed to attract attention. Then fogs are frequent in that vicinity, and though she is almost in the fairway of commerce she has had no way of indicating her position except by a bell rung by hand. Her lack of a proper fog signal is emphasized by the presence of one of the best and most far-reaching kind on the light-ship recently placed on Great Round Shoal, which is nearer to Nantucket than is this station. It is estimated that a proper light-ship with all the latest improvements, strong enough for this exposed and isolated station, and with such auxiliary steam power as will enable her to get on and off her station without help, and to steam up to her moorings to prevent the possibility of parting them, can be built for \$70,000, and it is recommended that an appropriation of this amount be made for that purpose.

122. *Cross Rip Light-Vessel, No. 5, Nantucket Sound, Massachusetts.*—She remained on her station all the year. She was supplied with sail cover, new galley stove, blocks, and like material.

123. *Succonnesset Shoal Light-Vessel, No. 6, Nantucket Sound, Massachusetts.*—On August 1, 1890, she broke adrift, losing her mushroom anchor and some 75 fathoms of chain. She was replaced on her station the next day.

130. *Vineyard Sound (Sow and Pigs) Light-Vessel, No. 41, western entrance to Vineyard Sound, Massachusetts.*—On February 15, 1891, she broke adrift, owing to her chain having caught under rocks, when 46 fathoms of chain and her mushroom anchor were lost. On February

*The new light-ship, No. 47, was, on August 1, 1891, placed on this station.

Second District.

19 she was replaced on her station, the tender *Geranium* coming from Boston for that purpose. On March 4 she again broke adrift in a severe northwest gale. After much trouble, in which the jib was split and the foregaff carried away, sail was made, and she anchored off East Chop the same day. As the tender *Verbena* was still under repair at New Bedford, a tug was employed to place her on her station. In April she was brought to New Bedford and received extensive repairs. New hawse pipes were put in, the deck was calked in part, the lantern houses were repaired, the rotten wood in the breasthook and apron was replaced, new cranes and bearers for the boat were supplied, the fenders were refaced, and the skylights and the top of the lantern house and engine room were re-covered with canvas. She was hauled out on the railway, when her copper was patched, her rudder was rehung, and other repairs were made. Extensive repairs were made to her steam fog-whistle machinery, and two new boilers were put in. On June 28, 1891, the vessel was replaced on her station.

131. *Hen and Chickens Light-Vessel, No. 2, entrance to Buzzards Bay, Massachusetts.*—Berths were substituted for hammocks, the medicine chest was replenished, the boat was repaired, tinware and galley stove and a new main boom for the ship were furnished.

— *Relief Light-Vessel No. 9.*—She was placed on Great Round Shoal station October 10, 1890.*

— *Relief Light-Vessel No. 39.*—She was placed on Vineyard Sound light-ship station on April 9, 1891, while light-ship No. 41 was at New Bedford under repair. When the Vineyard Sound light-ship was put back on her station on June 28, 1891, light-ship No. 39 was towed to New Bedford. She was supplied with sundry necessary articles.

Light-Ships Nos. 47, 48, and 49.—These light-ships, the construction of which was going on at the time of the last annual report, were completed and delivered during the year. Light-ship No. 47, built for the Great Round Shoal light-station, arrived at Woods Holl on May 8, where, according to the terms of the contract, the builder was to deliver her, and was accepted the following day. After being coaled and fitted for her station, she was towed to Pollock Rip station, as the vessel on that station was in need of immediate repair, and the relief light-ship No. 39 was on the Vineyard Sound station. Light-ship No. 48, built for the Sandy Hook station, was accepted on May 23, and was started for the general depot at Staten Island, New York, where, on May 25, she arrived. Light-ship No. 49, built for Bush Bluff light-station, Virginia, was accepted on June 8, and on June 11 arrived at Portsmouth, Va.

All these vessels have steam windlasses. Light-ship No. 47 has that of the Bath Iron Works, Hyde pattern; its weight is 20,300 pounds.

* On August 1, 1891, the new Light-ship No. 47, which was built for this station, took the place of Light-ship No. 9.

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Light-ship No. 48 has the Providence steam pump-brake windlass, of the American Ship Windlass Company; its weight is 22,000 pounds. Light-ship No. 49 has the steam windlass of J. P. Manton, agent; its weight is 19,000 pounds. All are fitted with the Crosby 12-inch chime steam whistle. All the lanterns and fittings were made and furnished from the general light-house depot at Tompkinsville, Staten Island, New York.

DAY OR UNLIGHTED BEACONS.

Middle Breakers, Roaring Bull, Brimbles, and Kettle-Bottom Ledges, in or near Salem Harbor, Massachusetts.—The holes were drilled in the rocks and forged-iron spindles, with distinguishing marks, were set on the three last-named ledges, and it is hoped the sea will permit the setting of the spindle on Middle Breakers during the present working season.

Half-Way Rock Beacon, off Salem Harbor, Massachusetts.—The wooden tripod on the beacon was renewed.

False Spit Beacon, Boston Harbor, Massachusetts.—The four heavy stone braces were righted and heavily bolted to the central granite column and about 75 tons of riprap stones displaced by the sea were replaced around the beacon.

Nixs Mate Beacon, Boston Harbor, Massachusetts.—About 60 lineal feet of the retaining wall, 17 feet high, was taken down and rebuilt; its earth backing was removed and replaced; about 75 tons of riprap stones displaced by the sea were replaced around the beacon, and the pyramidal tower surmounting it was in great part renewed.

Scituate Harbor, Massachusetts.—Both beacons were righted, painted, and repaired.

Tobias Rock, off Cohasset Massachusetts.—A forged-iron spindle, 35 feet long and 8 inches and 4 inches in diameter at butt and tip, surmounted by a cask upon its bilge, was set upon this rock.

Outer Rock, off Angelica Point, Mattapoissett Harbor, Massachusetts.—A forged-iron spindle, 20 feet long and 6 inches and 4 inches in diameter at butt and tip, surmounted by an upright cask, was set upon the rock.

The other beacons in the second district are believed to be in good condition.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

71, 72. *Cape Ann, Massachusetts.*—This 10-inch steam whistle was in operation 465 hours and consumed about 30 tons of coal.

84. *Boston, Massachusetts.*—This first-class steam siren was in operation 793 hours, consuming about 56 tons of coal.

13. *Race Point, Massachusetts.*—The 12-inch steam whistle was in operation 614 hours and consumed about 29 tons of coal.

Second District

99. *Cape Cod, Massachusetts.*—This first-class operation 567 hours, consuming about 6 tons of

105. *Pollock Rip Light-Vessel, No. 42, Massachusetts.*—This steam whistle was in operation 914 hours and of coal.

109. *Great Round Shoal Light-Vessel, No. 47, Massachusetts.*—This light-ship, which has a 12-inch steam chime whistle, will be placed on this station by mid-summer.

127. *West Chop, Massachusetts.*—This 10-inch steam whistle was in operation 494 hours and consumed about 25 tons of coal.

130. *Vineyard Sound Light-Vessel, No. 41, Massachusetts.*—The 12-inch steam whistle was in operation 905 hours and consumed about 77 tons of coal.

BUOYAGE.

In July the whistling buoy in Great Round Shoal Channel was lost. It was seen to sink by a passing United States ship, probably having been run into previously by some vessel. In August Lucas Shoal Bell Buoy was run into, when the bell was broken, and in September it was again run down and sunk. On August 29, an iron wreck buoy was placed over the wreck of the schooner *Weybosset* in Pollock Rip Slue. On September 26 a bell buoy was established off Normans Woe Rock, Gloucester Harbor.

During October a severe gale caused much damage to the buoys along the coast. The bell buoy and the first-class nun buoy in Pollock Rip Slue were lost, and the whistling buoy off The Graves, Boston Harbor, was dragged on the rocks and badly damaged. A wreck buoy was placed in Broad Sound, Boston Harbor, over the wreck of the schooner *Louisa Smith*. In December the whistling buoy off Peaked Hill Bars went adrift and came on shore off Highland Light badly damaged. The whistling buoy off Hen and Chickens Reef went adrift and came on shore near Cuttyhunk light-station badly damaged. In January the bell buoy off Great Faun Bar, Boston Harbor, was run into, when the bell was sheared off and lost. On March 25 the whistling buoy off Plymouth, Gurnet, broke adrift and brought up on the beach to the eastward of the light-station, where it was recovered somewhat damaged. In April the bell buoy on West Island Ledge, Buzzards Bay, was moved to a new position off Mosher Ledge. A new spar buoy was placed off Parker Point entrance to Great Woods Holl Harbor. The whistling buoy off Gloucester was run into in May, when the whistle was disabled. Several wreck buoys in Vineyard Sound and elsewhere were taken up during the year, the obstruction each marked having been removed or broken up.

Second District.**DEPOTS.**

Lovells Island, Boston Harbor, Massachusetts.—The wharf at this depot was temporarily repaired in January, and covered with sheathing to make it safe to pass over. Soon after the close of the fiscal year, extensive repairs will be made and the wharf will be entirely relaid.

Woods Holl, Little Harbor, Massachusetts.—The wharf, 398 feet in length, was entirely rebuilt, two wheeling stages were renewed, and minor repairs were made to the sheds.

Machine and lamp shop, Boston.—A Windsor lathe, 14 inches by 6 inches, and an Elliot drill press were provided.

TENDERS.

The Geranium.—This steamer was almost constantly employed during the year. In July, 1890, a hard patch was put on the port furnace and a soft patch on the middle furnace. In January, eleven hard and twelve soft patches were put on the furnaces, and a set of gibs for the cross-head of the main engine were supplied. The eccentric hooks were overhauled, new rolls for the rocker-shaft arms were furnished, and the feed pipes and donkey engine were overhauled and repaired. In June, new hawse pipes were put in and davits refitted. A new awning, rubber hose, ice chest, mast band, etc., were supplied. She is now in good condition, but on account of her crankness great trouble is experienced in working buoys and doing like work with her. During the year she steamed 7,669 miles and consumed 768 tons of coal.

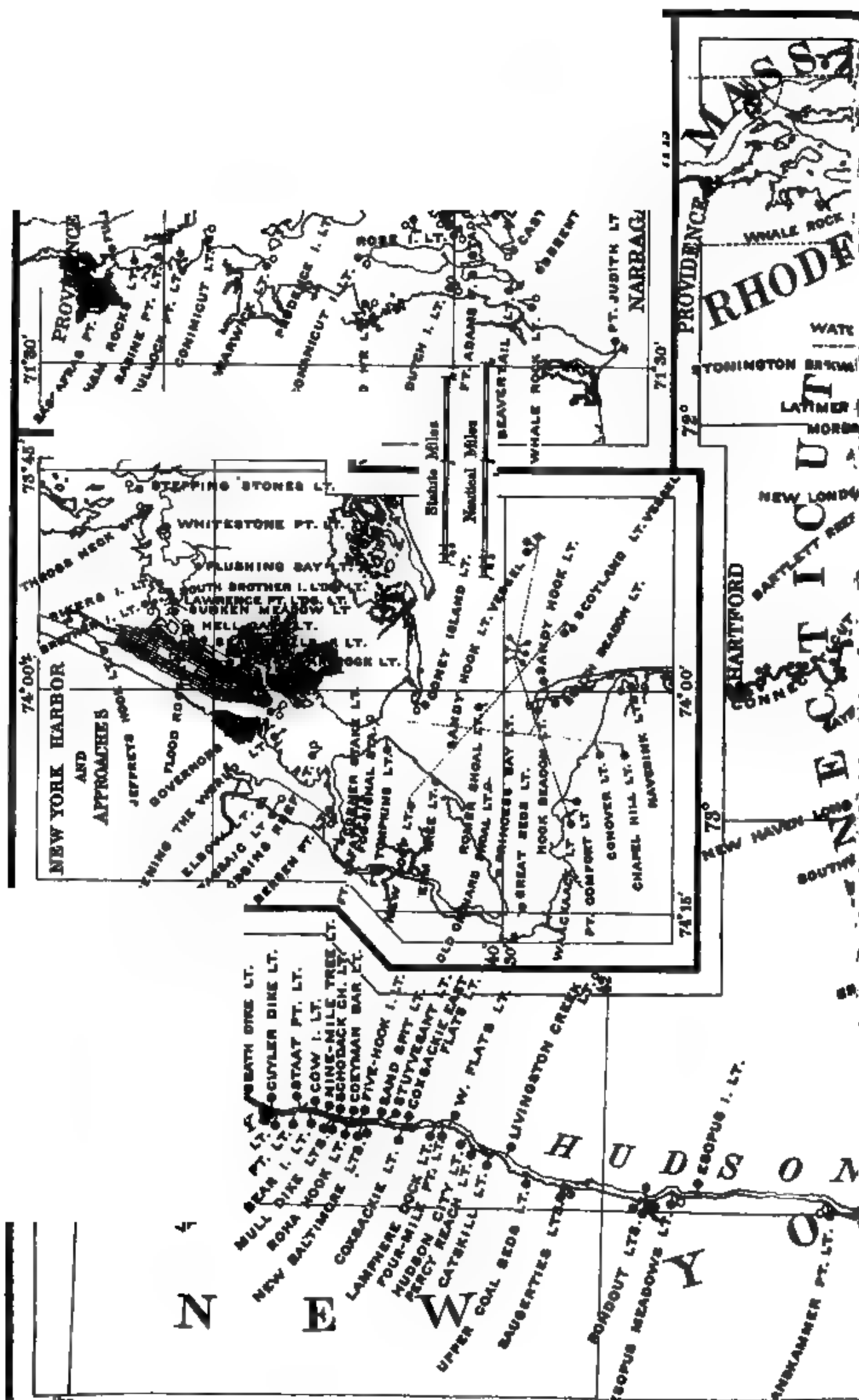
The Verbena.—This steamer was constantly employed during the year when not under repair. On October 15 soft patches were put on the furnaces. In January she went to New Bedford for repairs to her boiler, which were completed April 17, and consisted of some forty patches on her boilers, new ash pans, one bottom blowpipe, a set of grate bars, new piston springs, and repairs to her wheels. On April 28, Capt. C. I. Gibbs was sent to New York to attend to fitting out the new steam-tender *Azalea*, when Mr. John A. Peak, the mate of the *Verbena*, who was put in charge of her, carried on the work of the district in a most satisfactory manner. Various articles of outfit were supplied during the year. Although old, the *Verbena* is now in fair condition. During the year she steamed about 9,106 miles and consumed some 753 tons of coal.

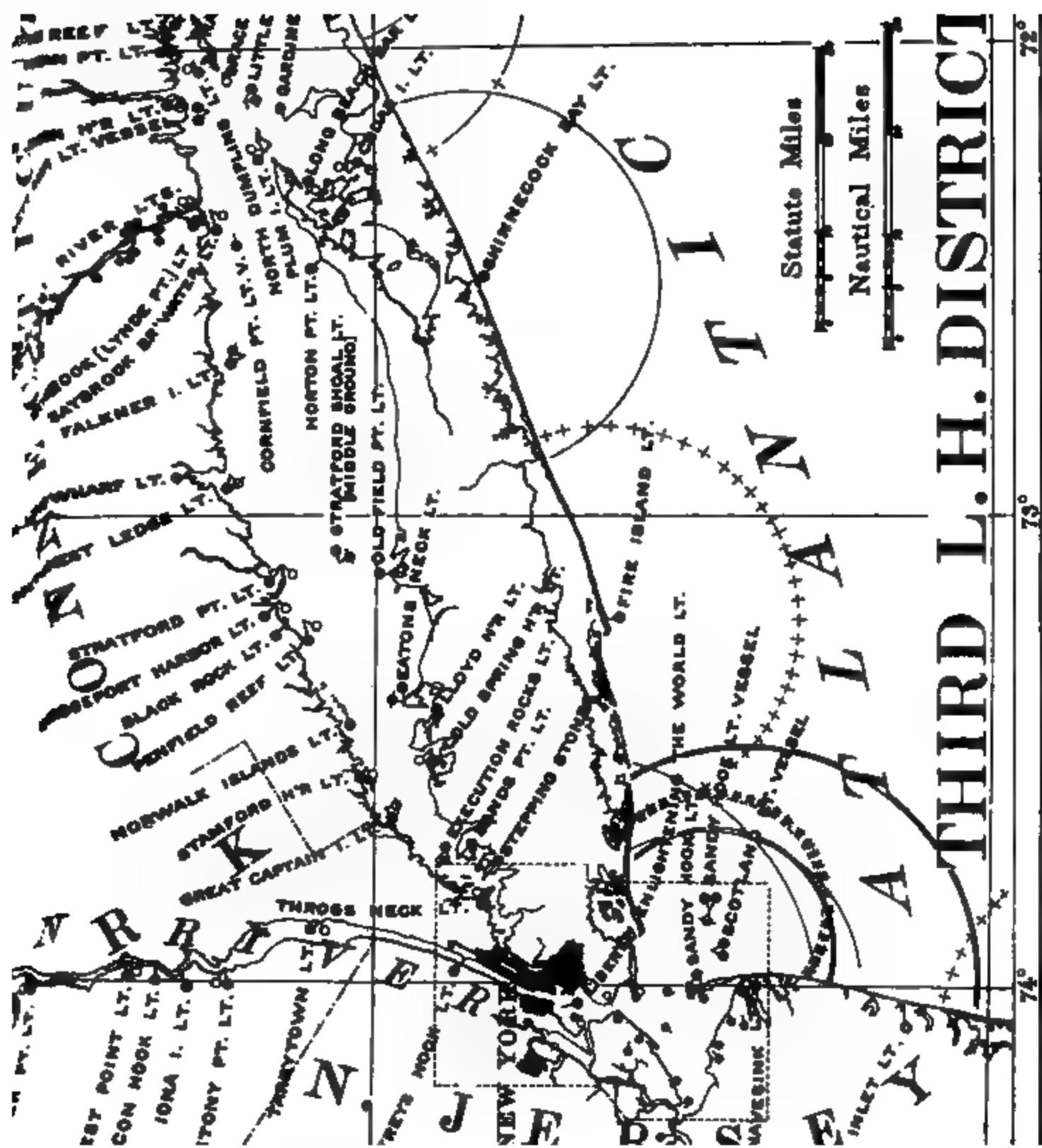
The Azalea.—This new steam tender, which was built for use in this light-house district, was delivered on June 25 to the Light-House Establishment at Woods Holl. She is fully described in an appendix to the last annual report, in which her plans and specifications are given.

The Myrtle.—This steamer, used for construction and repair in the first and second light-house districts, steamed upwards of 13,105 miles,

Second District

and consumed some 672 tons of coal. The at rebuilt, the propeller, which had become loose, was re-secured to the shaft, and its sleeve lined with lignum-vitæ. Extensive repairs were made to the boiler, and minor repairs were made to the shoe, stern-bearing, rudder, and machinery. The tender is now in excellent condition throughout hull, rigging, and machinery. Except while undergoing repairs, she was constantly in active employment throughout the year, and delivered a large quantity of building materials at stations in both the first and second light-house districts.





THIRD L. H. DISTRICT

THIRD DISTRICT.

The third district includes and extends from Elisha Ledge, off Warren Point, Rhode Island, to a point on the coast of New Jersey opposite Shrewsbury Rocks, and embraces all aids to navigation on the sea and sound coast of Rhode Island, Connecticut, and New York, and of New Jersey above the Highlands of Navesink; Mount Hope, Narragansett, and New York Bays, Providence, Connecticut, Thames, Raritan, and Hudson Rivers, Whitehall Narrows, and Lakes Champlain and Memphremagog.

Inspector.—Capt. Frederick Rodgers, U. S. Navy, to September 21, 1890; since then, Capt. Henry F. Picking, U. S. Navy.

Engineer.—Maj. David P. Heap, Corps of Engineers, U. S. Army.

There are in this district—

Light-houses and beacon lights, including 63 post-lights.....	201
Light-ships in position.....	7
Light-ships for relief.....	2
Day or unlighted beacons.....	37
Fog signals operated by steam or hot-air engines.....	13
Fog signals operated by clockwork.....	49
Electric buoys.....	6
Whistling buoys in position.....	5
Bell buoys in position.....	15
Other buoys in position.....	541
Steamer <i>Armeria</i> , used for supplying the light-stations of the Atlantic and Gulf coasts.....	1
Steamers <i>John Rodgers</i> and <i>Cactus</i> , buoy tenders and for supply, inspection of light-stations, and for repair of the cables, etc., of the electric-lighted buoys..	2
Steamer <i>Gardenia</i> , buoy tender and for freight.....	1
Steam launch <i>Bouquet</i> , for attending to the electric-lighted buoys.....	1
Steamers <i>Mistletoe</i> and <i>Grace Darling</i> , used for works of construction and repair of light-stations, fog signals, and day beacons.....	2
Steamer <i>Nettle</i> , for works of construction and repair on Lake Champlain.....	1

Electric buoys.

Main (Gedney) Channel into Lower Bay of New York:

Black G 1.	Red G 2.
Black G 3.	Red G 4.
Black G 5.	Red G 6.
Whistling buoys.	
1. Point Judith.	4. Gedney Channol.
2. Southwest Ledge (Block Island).	5. Fire Island.
3. Cerberus Shoal.	

Third District.*Bell buoys.*

1. Ball.	9. Robbins Reef.
2. on Rock.	10. Fort Wadsworth.
3. Island, north.	11. Old West End Pier.
4. Hill.	12. Quickstep.
5. Long Reef.	13. Swash Channel.
6. Ledge Breakwater.	14. Rockaway.
7. alk Islands.	15. Fire Island.
8. uors Island.	

Following lights and fog signals were established during the

1. y Island, N. Y., August 1, 1890.	11. Scovill Rock, Conn., June 20, 1891.
2. Jackie East Flats Post-Light, August 1, 1890.	12. Paper Rock, Conn., June 20, 1891.
3. e Point Pierhead Light, N. Y., October 18, 1890.	13. Bodkin Rock, Conn., June 20, 1891.
4. ington Breakwater, October 1, 1890 (south end of north tension).	14. Pistol Point, Conn., June 30, 1891.
5. ington Breakwater, north end, October 20, 1890.	
6. lon Landing Pierhead Light, October 22, 1890.	
7. h Brother Ledge Post-Light, June 11, 1891.	
8. rence Point Post-Light, June 1, 1891.	
9. y Rock, Conn., June 20, 1891.	
10. t Landing Conn., June 20, 1891.	

Fog signals.

Coney Island (bell), August 1, 1890.

Esopus Meadows (bell), February 14, 1891.

Discontinued.

1. Burlington Breakwater, north end, October 21, 1890.
2. Rouse Point, N. Y., March 31, 1891.

LIGHT-HOUSES.

le Hill, Narragansett Bay, Rhode Island.—The fog-signal bell about 3 feet and set on iron brackets. Various repairs were

port Harbor (Goat Island), Narragansett Bay, Rhode Island.—A clock and apparatus for operating an occulting light was repaired. Various repairs were made.

e Island, Narragansett Bay, Rhode Island.—Boatways were repaired. A new cradle was made for the boat, and some minor repairs to the rig were completed.

rick, Narragansett Bay, Rhode Island.—The following recommendation, which was made in the Board's last annual report, is renewed: A fog signal in duplicate is needed here. It can be established at an estimated cost of \$5,000. It is recommended that an appropriation of this amount be made.

nt Judith, entrance to Narragansett Bay, Rhode Island.—The house was wainscoted. The barn was thoroughly overhauled, a new

Third District.

woodshed and storehouse and 700 feet of wire-ribbon fence, with rail, were built, and various minor repairs were made.

173. *Montauk Point, New York.*—A 2½-inch drive-well tube was driven with a deep-well pump attached and a pump house was built. Various repairs were made.

174. *Stonington Breakwater, Fishers Island Sound, Long Island Sound, Connecticut.*—New fog-bell apparatus was set up and various minor repairs were made.

175. *Latimer Reef, Long Island Sound, off Mystic, Connecticut.*—Boat-hoisting shears and a winch were set up, a rail was cut on the pier to give access to the boat landing, and other minor repairs were made.

178. *North Dumpling, Fishers Island Sound, New York.*—A new bell tower was built and fitted with new apparatus, and red sectors were delivered at the station. Various minor repairs were made.

179. *New London Harbor, Long Island Sound, Connecticut.*—A red sector was delivered at the station and various repairs were made.

— *Black Ledge, New London Harbor, Long Island Sound, Connecticut.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The necessity for establishing a light and an efficient steam fog signal in such a position as to enable vessels to enter and leave the harbor of New London, Conn., has become evident, and especially so for the aid of those approaching from seaward. The numerous outlying shoals and ledges surrounding the entrance to this harbor make the approach to it dangerous in thick weather. The location of the present New London light and fog-signal station is so far inside the obstructions as to be partially ineffective as an aid for the purpose of safe navigation of this entrance. The commerce of the port of New London has so increased since the erection of the present light as to change the conditions materially. In consequence of the recent grounding of the steamer *City of Worcester*, on Bartlett Reef, complaint was made that the fog bell of Bartlett Reef light-ship was not adequate to the needs of vessels approaching New London from the westward in a fog, and it was stated that Congress would be petitioned to replace the present light-ship with another carrying a steam fog signal. In view of these facts and the further fact that a naval station is in operation on the Thames River, which empties into New London Harbor, it is suggested that a light and a steam fog-signal station be established on the southwest ledge on the eastern side of the entrance to New London Harbor. Estimate is made that it can be done for \$45,000. It is therefore recommended that an appropriation of that amount be made therefor.

— *Thames River, Connecticut.*—The appropriation for these lights is now available and the work of establishing them will be begun soon.

184. *Plum Island, Gardiners Bay, Long Island Sound, New York.*—A new fog bell was substituted for the old one, and various repairs were made.

186. *Cedar Island, entrance to Sag Harbor, Long Island Sound, New York.*—The boathouse was moved and overhauled, a drive well was put down, and various repairs were made.

187. *Saybrook Breakwater, mouth of the Connecticut River, Long Island*

Third District.

Sound, Connecticut.—A landing stage and gangway were built, 500 tons of riprap stone were placed for the protection of the pier, a contract was made for placing 700 tons more, and various repairs were made.

190. *Essex Reef Post-Light, Connecticut River, Connecticut.*—A safety line was fitted around the beacon 3 feet above the pier.

191. *Joshua Rocks (lower) Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

192. *Joshua Rocks (upper) Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

195. *Deep River Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

196. *Chester Rock Post-Light, Connecticut River, Connecticut.*—A safety line was fitted around the beacon 3 feet above the pier.

197. *Eddy Rock Post-Light, Connecticut River, Connecticut.*—A post-light was established.

198. *Rock Landing Post-Light, Connecticut River, Connecticut.*—A post-light was established.

199. *Scovill Rock Post-Light, Connecticut River, Connecticut.*—A post-light was established.

200. *Paper Rock Post-Light, Connecticut River, Connecticut.*—A post-light was established.

201. *Bodkin Rock Post-Light, Connecticut River, Connecticut.*—A post-light was established.

202. *Mouse Island (lower) Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

203. *Mouse Island (upper) Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

204. *Pistol Point Post-Light, Connecticut River, Connecticut.*—A post-light was established.

206. *Dividend Pier Range (front) Post-Light, Connecticut River, Connecticut.*—The spring freshet having undermined the post, it was re-established.

207. *Dividend Pier Post-Light, Connecticut River, Connecticut.*—A new post for exhibiting the light was driven.

208. *Two Piers Channel Post-Light, Connecticut River, Connecticut.*—A post for exhibiting the light was driven.

211. *Colt Pier Post-Light, Connecticut River, Connecticut.*—A post for exhibiting the light was driven.

213. *Horton Point, north side of Long Island, New York.*—An oil-house was built, and various repairs were made.

215. *Southwest Ledge, off New Haven, Long Island Sound, Connecticut.*—A crane was built and attached to the tower for hoisting boats and material, and various repairs were made.

— *Sheffield Harbor, Long Island Sound, Connecticut.*—The following

Third District.

recommendation, made in the Board's annual report for the last two years is repeated:

A large and increasing commerce now centers here. During the past year nearly 100,000 tons of coal were landed here in addition to more than that quantity of general merchandise. The New England Terminal Railway Company state that they will begin the transportation of freight in cars on the decks of car-floats and transfer steamers, and the quantity of tonnage will then be more than double. After leaving Execution Rocks light there is nothing to run them in thick weather except a buoy. It is claimed that a light placed here will render more safe the navigation at the entrances of the harbors of Sheffield and South Norwalk. It is proposed to build a small structure with a light and fog bell at the 4-foot spot off Norroaton Point, now marked by a red and black buoy. The structure should consist of an iron caisson filled with concrete, surmounted by a wooden tower to carry the light and fog bell. It is estimated that the work can be done for \$10,000. It is recommended that an appropriation of this amount be made therefor.

225. *Lloyd Harbor, Long Island Sound, New York.*—The chimney on the dwelling was rebuilt from the roof, and flashing was fitted over the front door to stop the leak.

229. *Execution Rocks, Long Island Sound, New York.*—The caloric engines were overhauled and new parts were fitted. A new fog-signal building, with a coal shed attached, was built, a cistern in the basement of the tower was partly completed, contract for new boilers and riprap stone was made, and various repairs were made.

238. *Hell Gate Post-Light, East River, New York.*—Earth and stone filling were placed back of the sea wall, and gutters and leaders were fitted on the tower.

241. *Man-o'-War Rock Post-Light, East River, New York.*—An iron platform was fitted to the spindle, for the convenience of the keeper.

242. *Shinnecock Bay, south side of Long Island, New York.*—A new barn was completed, a new shingle roof was put on the keeper's dwelling, and various repairs were made.

243. *Fire Island, south side of Long Island, New York.*—The oil-house was completed, and various repairs were made.

250. *Hook Beacon, Sandy Hook, New Jersey.*—The fog-signal engines were overhauled and repaired, a dwelling for the keepers of the Electric-Buoy Station was built, and various repairs were made.

255. *Waackaack (rear), New Jersey.*—The preliminary levels and surveys were made preparatory to carrying out the provisions made by Congress in the act approved on March 3, 1891, for erecting a new tower at this point.

— *Old Orchard Shoal, Princess Bay, New York.*—An appropriation was made by the act approved on March 3, 1891, for establishing a light-house and fog signal at or near Old Orchard Shoal, Princess Bay, New York. The site has been located, soundings have been made, plans prepared and adopted, and other preliminary measures have been taken towards beginning the work.

Third Distri

256. *Elm Tree Beacon, Staten Island, New York.*—A new foundation was built, and the tower was moved on to the New Dorp and Swash Channel Range.

258. *Princess Bay, on Staten Island, New York.*—A new fence, with necessary gates, was built on the line of the reservation, and various repairs were made.

263. *Coney Island, New York Bay, New York.*—The fog bell was moved to a new position, a close board fence was built on two sides of the reservation, and window screens were made and fitted, and the window sill was overhauled.

267. *Liberty Enlightening the World (Statue of Liberty), on Bedloe Island, New York Harbor, New York.*—The following recommendation which was made in the Board's last three annual reports is renewed:

Fifty thousand dollars is needed for finishing the pedestal of this statue, which, by act of Congress, has been placed under the care of the Light-House Board. Recommendation is made that this additional appropriation be made for that purpose.

— *Rockland Lake, Hudson River, New York.*—The following recommendation, made in the last three annual reports, is renewed:

There is a shoal known as Oyster Beds in the Hudson River about 28 miles above New York City, off the Rockland Lake Landing, which the Hudson River pilots and parties engaged in the business of transportation of passengers and freight ask to have marked by a light and fog signal. The old-fashioned side-wheel steamers engaged in the navigation of the Hudson River were light-draught vessels, and could pass over this shoal, but many of the new steamers are propellers, and are of such heavy draught that the shoal is dangerous to them. Steam vessels all lay their courses close to the Rockland Lake Landing. If there were a light and fog signal on the shoal in question, they would, coming downstream and taking departure from Stony Point Light, lay their course direct for the new light until the Kingland Point Light becomes visible, which would indicate a turning point. These courses would be reversed in going up-stream. In times of snow or fog a signal would obviously be invaluable. From an examination recently made it has become evident that the safety of navigation requires that a light and fog signal should be established off Rockland Lake Landing on the eastern end of the bank, where the Coast Survey chart gives 9½ feet of water. It is estimated that this can be done for \$35,000, and the Board recommends that an appropriation of that amount be made for this purpose.

This was authorized by act of March 2, 1889, but no appropriation was made therefor.

274. *Tarrytown, Hudson River, New York.*—Some 500 tons of riprap stone were placed for the protection of the pier.

275. *Stony Point, Hudson River, New York.*—The boat landing near the fog-signal tower was completed.

280. *Esopus Meadows, Hudson River, New York.*—A fog bell operated by machinery was established and has been in operation since the opening of navigation in 1891.

Third District.

287. *Livingston Creek Post-Light, Hudson River, New York.*—A new ladder was made and fitted on the pier.

294. *Corsackie East Flats Post-Light, Hudson River, New York.*—A dolphin was built, to replace the one carried away by the ice, from which the light is exhibited.

295. *Corsackie, Hudson River, New York.*—Some 500 tons of riprap stone were placed on the up-stream side of the pier.

296. *Stuyvesant, Hudson River, New York.*—Some 700 feet of four-strand wire-ribbon fence, with 2 by 4 inch cap, were built, three boundary posts were set, and various repairs were made.

297. *Sand Spit Post-Light, Hudson River, New York.*—A pile dolphin was built, to replace the pier and beacon carried away by the ice, from which the light is exhibited.

298. *New Baltimore Post-Light, Hudson River, New York.*—A stake, lantern, and oil closet were set up.

299. *New Baltimore Dike Post-Light, Hudson River, New York.*—A stake, lantern and oil closet were set up.

300. *Fire-Hook Island Post-Light, Hudson River, New York.*—A stake, lantern and oil closet were set up.

303. *Schodack Channel Post-Light, Hudson River, New York.*—A stake, lantern and oil closet were set up.

305. *Mull Dike (upper end) Post-Light, Hudson River, New York.*—A dolphin was rebuilt, to replace the pier carried away by the ice, from which the light is exhibited.

306. *Nine-Mile Tree Post-Light, Hudson River, New York.*—A stake was set in place.

308. *Bear Island Post-Light, Hudson River, New York.*—A stake, lantern and oil closet were set up and 300 tons of riprap stone were placed to protect the pier.

312. *Cuyler Dike Post-Light, Hudson River, New York.*—A new stake, lantern and oil closet were set up, and the planking on the pier was repaired.

313. *Bath Dike Post-Light, Hudson River, New York.*—A stake, lantern and oil closet were set up and a new plank was fitted on the top of the pier.

926. *Newport Wharf, Lake Memphremagog, Vermont.*—The pier was rebuilt, and a new post, 40 feet high, was put up, fitted for two lanterns 15 feet apart vertically.

927. *Windmill Point, Lake Champlain, Vermont.*—A summer kitchen was built, the old barn was removed, a new one and a line fence were built, and various repairs were made.

928. *Isle la Motte, Lake Champlain, Vermont.*—Steps fitted with a hand rail were built leading from the shore to the top of the hill, and various repairs were made.

Third District.

Point aux Roches, Lake Champlain, New York.—All the out-works were thoroughly overhauled and repaired, 1,760 feet of new picket with 2 by 4 inch rail, was built, 1,500 feet of the old fence repaired, and various repairs were made.

North Hero, Lake Champlain, Vermont.—The pier was painted and an oil and lamp closet was fitted.

South Hero, Lake Champlain, Vermont.—The pier was painted and an oil and lamp closet was fitted.

Gordon Landing Pierhead Light, Lake Champlain, New York.—A lantern light was established on the outer end of Gordon Landing breakwater.

Buff Point, Lake Champlain, New York.—Some 70 feet of secotways were built, and various repairs were made.

Wilmington Breakwater Beacon (north extension), Vermont.—The beacon on the north end of the old breakwater, after being moved to the north end of the north extension, and placed on foundation built for the purpose.

Wilmington Breakwater (south end of north extension), Vermont.—A lantern light was established on the south end of the north extension to mark the opening between the breakwater and the north extension.

Wilmington Breakwater South Beacon, Vermont.—An iron ladder was added to the pier, 240 feet of plank walk was built on top of the pier leading from the landing to the beacon, and two panes of iron were set.

Split Rock, Lake Champlain, New York.—A wooden cistern was put up, and connected with the leaders, 900 feet of wire fence, necessary gates, was built and various repairs were made.

Catch Point, Lake Champlain, New York.—A survey of the property was made. As soon as the title is vested in the Government the work of establishing the light will be commenced.

At the beginning of the year there were 126 light-houses and 63 beacons in this light-house district. Of this number 133 have received lights of greater or less magnitude, and in addition 1 light-house and 2 lights have been established. Every possible repair has been made which the funds allotted would permit, and the entire district is now in excellent order.





Third District.**REPAIRS.**

At each of the following-named stations repairs of greater or less extent were made during the year:

- | | |
|---|---|
| 140. Sakonnet, R. I. | 252. Conover Beacon (front), N. J. |
| 142. Beaver Tail, R. I. | 253. Chapel Hill Beacon (rear), N. J. |
| 144. Fort Adams, R. I. | 259. Great Beds, N. Y. |
| 149. Dutch Island, R. I. | 264. Fort Lafayette, N. Y. |
| 150. Gull Rocks, R. I. | 265. Fort Tompkins, N. Y. |
| 152. Conanicut Island, R. I. | 267. Liberty Enlightening the World, N. Y. |
| 154. Prudence Island, R. I. | 271. Passaic, N. J. |
| 156. Muscle Bed Shoals, R. I. | 281. Rondout, N. Y. |
| 158. Warwick, R. I. | 286. Upper Coal Beds post-light, N. Y. |
| 160. Conimicut, R. I. | 289. Percy Reach post-light, N. Y. |
| 161. Bullock Point, R. I. | 292. Four-Mile Point, N. Y. |
| 162. Sabine Point, R. I. | 301. Coeyman Bar post-light, N. Y. |
| 166. Whale Rock, R. I. | 302. Roha Hook post-light, N. Y. |
| 168. Block Island (north), R. I. | 304. Mull Dike (lower end) post-light, N. Y. |
| 171. Block Island (southeast), R. I. | 307. Cow Island post-light, N. Y. |
| 172. Watch Hill, R. I. | 924. Maxfield Point, Vt. |
| 181. Race Rock, N. Y. | 925. Whipple Point, Vt. |
| 182. Little Gull Island, N. Y. | 932. Cumberland Head, N. Y. |
| 183. Gardiners Island, N. Y. | 934. Plattsburg Breakwater (northeast), N. Y. |
| 185. Long Beach Bar, N. Y. | 937. Colchester Reef, Lake Champlain, Vt. |
| 188. Saybrook, Conn. | 941. Juniper Island, Vt. |
| 189. Calves Island post-light, Conn. | 944. Barber Point, N. Y. |
| 214. Falkner Island, Conn. | 945. Crown Point, N. Y. |
| 217. Stratford Point, Conn. | 947. Old Maid Place, Vt. |
| 218. Stratford Shoals, N. Y. | 951. No. 12, opposite Belden Dock, Vt. |
| 219. Old Field Point, N. Y. | 952. No. 11, Chilson Bend, N. Y. |
| 220. Bridgeport Harbor, Conn. | 953. No. 9, Lower End of Two Channels, N. Y. |
| 221. Black Rock, Conn. | 954. No. 8, Maple Bend, N. Y. |
| 222. Penfield Reef, Conn. | 955. No. 7, Head of Two Channels, N. Y. |
| 223. Norwalk Islands, Conn. | 956. No. 6, Long Reach, N. Y. |
| 224. Eatons Neck, N. Y. | 957. No. 5, Steam-mill Point, N. Y. |
| 226. Cold Spring Harbor, N. Y. | 958. No. 4, South of Snody Dock, Vt. |
| 228. Great Captain Island, N. Y. | 959. No. 3, Opposite Chapman Dock, N. Y. |
| 230. Sands Point, N. Y. | 960. No. 2, Carey Camp, N. Y. |
| 231. Stepping Stones, N. Y. | 961. No. 1, Benjamin Place, Vt. |
| 232. Throgs Neck, N. Y. | |
| 233. Whitestone Point post-light, N. Y. | |
| 236. North Brother Island, N. Y. | |
| 246. Navesink, N. J. | |
| 248. Sandy Hook, N. J. | |

LIGHT-SHIPS.

141. *Brenton Reef Light-Vessel, No. 11, entrance to Narragansett Bay, Rhode Island.*—This vessel was injured by the British steamer *Curlew*, which ran into her on November 26, 1890. Negotiations were opened with the agents of the steamer, who agreed to pay for the necessary

Third District.

repair. The ship has been brought in and, besides the damage caused by the collision, is being repaired. Other needed repairs are also being made. The port hawse pipe will be replaced, new combings are being placed on the steerage hatch, the boat davits on the starboard side are being strengthened, and four large cleats are being placed forward and aft, for the convenience of steam tenders when alongside. She will be docked and her bottom will be examined and such repairs will be made to it as may be needed. She received during the year, rope, paint, windsail, medicines, fire brick, rations, fuel, and ship chandlery.

155.- *Hog Island Shoal Light-Vessel, No. 12, Narragansett Bay, Rhode Island.*—This vessel was rebuilt in 1874, at a cost of \$16,488.13. She will be good probably for service during another year, but then she will need general repair at cost of about \$12,000. Boring the vessel on one side, six holes out of thirteen developed rotten wood. The planking along the line of the metal sheathing aft is rotten, as is also the stern post. The stern and the cat-head are unsound. The deck beams and the apron above the main deck are sound and the other parts of the vessel are in fair condition. There were furnished to her during the year, rope, canvas, clocks, flags, rations, fuel, and the like.

This vessel, which is of but 150 tons burden, was built in Philadelphia in 1846, and was used on a spit off the entrance to York River, Virginia. When she was no longer needed there she was transferred to mark Wolf Trap Shoal, in Chesapeake Bay. When a screw-pile light-house was placed there in 1870, this light-ship was sent to the general light-house depot, where she was repaired sufficiently to be used at Eel-Grass Shoal, in Long Island Sound, relieving the old light-house tender *Guthrie*, which was then condemned and sold. In 1872 this light-ship was relieved, as she was no longer able to remain there, but after being repaired she was placed on Cornfield Point, Long Island Sound, off the mouth of Connecticut River. In 1883 she was again found to be unseaworthy and was replaced by another vessel. Then she was put in as good repair as was possible to so old a ship, and was again placed on Eel-Grass Shoal. After she had been there about a year she was, upon complaint, again surveyed, and it was reported that it would cost \$20,000 to put her in sufficiently good repair to remain even on this station. Instead of doing this, however, it was decided to replace the light-ship by the erection of a light-house, at an expense of \$25,000, on Latimer Reef, which is sufficiently near to take the place of the light-ship. This was done in 1884, and this light-ship was relegated to the condition of a relief light-ship and was made ready for occasional use.

In 1885 it was found needful to place a light-ship on Hog Island Shoal, Narragansett Bay, to take the place of a private light which had been maintained by the Old Colony Steamboat Company. As no appropriation was available and as the need was imminent, light-ship No. 12 was

Third District.

again patched up and moored in that position. Since that date she has been kept there, except when, not infrequently, she was under repair. It is now found that she is structurally weak from general decay, induced by her old age, and that she is completely beyond economical repair. While she has been quite useful in that position it has become apparent that she could have been of still greater use to the enormous commerce passing this point if she had a steam fog signal. No attempt has been made to fit one to her, as she is too small and too weak to carry the weight and support the strain.

The time has now come when it is deemed necessary to replace this small, weak, worn-out old vessel by a new, strong ship of at least double her size and strength, not only to occupy this station, but in its turn to take its place on the outside exposed stations. It is also proposed that she shall have such steam power as will not only operate a first-class fog signal, but will enable her to get on and off her station with her own steam, and also to steam up to her moorings when otherwise she would be blown away from her place, dragging her anchor or parting her chain cables. It is estimated that such a vessel can be built for \$70,000, and it is recommended that an appropriation of this amount be made for that purpose.

176. *Ram Island Reef Light-Vessel, No. 19, Fishers Island Sound, in Long Island Sound, New York.*—When this vessel is taken off station, which should be at an early date, expensive repairs will be required, as no important repairs on her have been made since 1876. The hawse pipe used for the mooring-chain is worn through. The rail on the star-board quarter is rotten in parts, and the repair of this will probably develop further defects. She received during the year rope, paints, sails, awnings, windlass-pawls, rations, fuel, and ship chandlery.

180. *Bartlett Reef Light-Vessel, No. 13, off New London, Long Island Sound, Connecticut.*—This vessel needs to have the sheathing on deck recalked. No other repairs are needed now, but next year probably a thorough overhauling will be required. She received during the year rope, cooking utensils, paint, flags, crockery ware, fuel, rations and similar supplies, and a new boat.

212. *Cornfield Point Light-Vessel, No 23, off the mouth of the Connecticut River, Long Island Sound, Connecticut.*—On March 19, 1891, she was run into and damaged by a scow in charge of the tugboat *U. S. Grant*. The light-ship was taken off her station on April 16, repaired for the damages received by collision and for other defects incidental to service, and returned to her station on May 27, 1891. The owner of the tug was held responsible for the damage due to collision and paid the costs. This vessel received during the year paint, awning, medicines, bedding, fuel, rations, and ship chandlery. Plans and specifications for the new vessel for this station, for which an appropriation of \$70,000 was made

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by Congress on August 30, 1890, have been prepared, and she is now being built at West Bay City, Mich.

244. *Sandy Hook Light-Vessel, No. 16, off the entrance to New York Harbor, New York.*—On May 15, 1891, the position of this vessel was changed $2\frac{1}{4}$ miles N.E. by N. from her old station. She received during the year hose, paint, fire-brick, bunting, rations, and fuel. The vessel is kept in good condition. The new light-ship, No. 48, with one fixed red light and one flashing red light and a steam fog signal, will be placed on the Sandy Hook Station on or about August 1, 1891.

245. *Scotland Light-Vessel, No. 7, off Sandy Hook, entrance to New York Bay, New York.*—The position of this vessel was changed May 15, 1891, $\frac{1}{2}$ mile N.E. $\frac{3}{4}$ E. from her former location. She is in fair condition and no immediate repairs of the hull are required. Such supplies as rope, paints, blocks, flags, trysail-mast, cooking utensils, crockery, tableware, rations, fuel, etc., were furnished.

— *Relief Light-Vessel, No. 20.*—This vessel is now at the light-house depot, New London, Conn. During the year she replaced the Cornfield Point light-ship from April 26 to May 27, 1891, and will soon take the place of the Brenton Reef light-ship.

— *Relief Light-Vessel, No. 17.*—This vessel was old and rotten. She was dismantled and condemned, and on June 22, 1891, she was, by order of the Secretary of the Treasury, turned over to the Navy Department for ordnance purposes.

DAY OR UNLIGHTED BEACONS.

Allen Rock Beacon, Warren River, Rhode Island.—A tower surmounted by an iron pointer. It is in bad order, partly down.

Oyster Pond Reef, on the eastern rock off Orient Point, Long Island, New York.—This beacon was mostly destroyed above the high-water line by heavy westerly gales and seas. It is proposed to substitute an iron cylinder, filled with concrete, for the superstructure of granite when rebuilt.

South Brother Island Ledge, East River, New York.—An iron spindle 35 feet long, set 3 feet into the ledge, surmounted by an iron sphere 5 feet in diameter, fitted with a bracket, surrounded at the base by an iron cylinder 4 feet in diameter and 10 feet high, was established to mark the entrance to Flushing Bay from the westward.

Lawrence Point Ledge, East River, New York.—An iron spindle 35 feet long, set 2 feet 6 inches into the rock, surmounted by a square black cage, fitted with tackle for hanging the light, surrounded at the base by an iron cylinder 4 feet in diameter and 10 feet high, was established to mark the entrance to Flushing Bay from the westward.

Third District.**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

142. *Beaver Tail, Rhode Island.*—The 10-inch steam whistle, with Crosby automatic signal, was in operation about 447 hours during the year, and about 27 tons of coal were consumed.

167. *Point Judith, Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 560 hours during the year, and consumed about 31 tons of coal.

171. *Block Island (southeasterly), Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 663 hours, consuming about 32 tons of coal.

173. *Montauk Point, New York.*—The first-class Daboll trumpet, worked by caloric engines, in duplicate, was in operation about 504 hours, and about 5 tons of coal were consumed.

179. *New London Harbor, Connecticut.*—The first-class Daboll trumpet, in duplicate, was in operation about 552 hours, and consumed about 10 tons of coal.

182. *Little Gull Island, New York.*—This second-class steam siren, in duplicate, was in operation about 450 hours, and consumed about 30 tons of coal.

214. *Falkner Island, Connecticut.*—The 10-inch steam whistle, in duplicate, was in operation about 493 hours, and consumed about 44 tons of coal.

215. *Southwest Ledge, Connecticut.*—The second-class Daboll trumpet, in duplicate, was in operation about 341 hours, and consumed about 2½ tons of coal.

218. *Stratford Shoal (Middle Ground), New York.*—The second-class Daboll trumpet was in operation about 625 hours, and consumed about 3½ tons of coal.

224. *Eatons Neck, New York.*—The second-class steam siren, in duplicate, was in operation about 476 hours, and consumed about 27 tons of coal.

228. *Great Captain Island, New York.*—The 10-inch steam whistle, Crosby automatic, in duplicate, was in operation about 382 hours, and consumed about 16½ tons of coal.

229. *Execution Rocks, New York.*—The first-class Daboll trumpet, caloric engines, in duplicate, was in operation about 302 hours, and consumed about 4½ tons of coal.

250. *Hook Beacon, Sandy Hook, New Jersey.*—The first-class steam siren, in duplicate, was in operation about 871 hours, and consumed about 53 tons of coal.

BUOYAGE.

In contrast with the preceding years, flow and volume of ice in bays, harbors, and other highways of the district was considerable, but not so heavy or constant as to cause serious loss or inconvenience to the ser-

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vice or to impede navigation to an appreciable extent. The ice contributed a good deal, however, to the breakage of the lamps of the electric-lighted buoys and to the extinguishment of their lights, and the efficiency of the system, as permanent aids to navigation, will probably not be finally determined until the electric buoys shall have been subjected to the action of such floating ice as until recent winters passed out to sea through the channels of New York Lower Bay. The electric-lighted buoys claim much of the time and service of the tenders, as will be seen in the details of the report on the operations of the electric station at Sandy Hook by Lieut. Commander C. H. West, U. S. Navy, assistant to the inspector, which report is submitted as an appendix in the latter part of this volume.

Gas buoys are not at present used in this district, but two of them are kept on hand at the depot to meet emergencies. The bell buoys of the improved kind continue to give satisfaction wherever placed. A bell buoy, designed by Mr. A. L. Woodworth, of Norfolk, Va., was twice tested for efficiency, first off Robbins Reef light-house and afterwards off the light-house depot. It differs from the bell buoys in use, chiefly in having a submerged blade which, when acted on by the current, operates an arm or clapper which rises from the deck of the float. The report of the tests stated that while the buoy might work well in a constant current, it would, in a tideway, during slack water, give no sound at all or a sound so faint that it would be of no service to navigation.

A general change in the buoyage of New York Harbor and Narragansett Bay was made on and after May 15, 1891. The change consisted in placing nun buoys, painted red, with even numbers, on the starboard hand of entry, and can buoys, painted black, with odd numbers, on the port hand; several buoys were discontinued; new buoys were placed as required, and the numbers on many buoys were changed to effect a proper sequence. A gas buoy was placed over the wreck of the steam dredge *Advance*, August 6, and discontinued October 14, 1890. One of the bell buoys off Robbins Reef, New York Harbor, was discontinued. A bell buoy was placed December 26, 1890, on Shagwong Reef, Long Island Sound, and another off the breakwater at Point Judith, Rhode Island, April 22, 1891.

Nine buoys of different kinds were discontinued and 43 new ones were put in place.

ELECTRIC-BUOY STATION SANDY HOOK, NEW JERSEY.

The weather in the past winter, in its treatment of the buoys, lamps, and cables of this station, was more severe than that of the winters of 1888-'89 and 1889-'90. There was floating ice, but not sufficient to give the buoys and their attachments an extreme exposure to damage caused solely by ice. Such a crucial test could be found only in a winter like that of 1874-'75 when light-vessels were carried from their moorings by

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ice, and buoys generally were set adrift. In the unusually heavy seas and stormy weather of the winter months many of the lamps were broken, and the tenders were constantly at work renewing them and repairing slight defects of the plant. There was no night, however, when there was not a sufficient number of lamps in operation to guide vessels over the bar. Another cause of the short life of the lamps was found in the defective quality of their manufacture. The operations of lamps and cables were carefully watched, defects were noted as they exposed themselves, and such remedies and improvement as experience suggested were applied. Lieut. Commander West's supervision in this expert field involved the constant exercise of care, energy, and skill. In his paper on this interesting subject, which appears as an appendix at the end of this volume, every necessary detail of construction, condition, and operation of the system is given clearly and technically in full. From the various examinations made by the tenders to locate faults and restore the insulation, it is found that the main cables are so defective, from imperfections of construction, the tensile strain of lifting them with anchors cast in the vicinity and the wear and tear of abrasion and service, as to make the necessity of renewing them, or large portions of them, a matter of early consideration. To meet emergencies, 17,000 feet of three-cord cable are required of which the cost is estimated at \$8,500.

The general condition of the plant on shore, as to engines, dynamos, boilers, wires, and testing instruments, is good.

During the past year a neat dwelling for the keeper in charge of the electric-buoy station was built on Sandy Hook. At slight expense these quarters are lighted by old incandescent lamps. To furnish feed-water to the boiler, a brick cistern, fed by rain from the roof, was built.

There is no doubt that great assistance is rendered by the electric buoys to vessels passing the bar at night. This is shown by the large percentage of increase in the number of vessels making use of this lighted highway. The increase per month from 1888-'89 to 1889-'90 of vessels bound out was 30.83 per cent; of vessels bound in, 100 per cent. The increase from 1889-'90 to 1890-'91 of vessels bound out was 24.52 per cent; of vessels bound in, 54.37 per cent. In November, 1890, 101 vessels passed the bar at night, 67 coming in and 34 going out, or an average of 3.4 vessels each night.

The largest steamers plying to the port of New York, such as the *Truria*, *City of Paris*, *Majestic*, etc., pass the bar at night. The *City of Paris*, for one, is 10,500 tons register.

The information in exact form, given in this place, is merely a few of the general facts and features of the subject, the details necessary to complete description and treatment being given, as stated in the report of Lieut. Commander West, assistant to the inspector of the third light-house district.

Third District.**DEPOTS.**

Staten Island, New York.—This is the general depot of the Light-House Establishment. The work done here in the engineer's department during the year consisted, as usual, of manufacturing and repairing lamps, supplies, fitting illuminating apparatus, making oil cans and boxes for supplying oil to light-stations, manufacturing light-house and light-ship lanterns, receiving material for manufacturing and repair work, repairing frames, etc., for light-houses, oil-houses, and other structures, repairing buoys and appendages, and general works of repair, etc., for the district. The work done in the inspector's department consisted in receiving, storing, and shipping building materials, illuminating apparatus, supplies, buoys, and fuel; testing paints, chimneys, and oils; inspecting and weighing provisions and general stores; loading and unloading the supply steamer and the tenders; cleaning and repairing buoys and appendages; repairing tenders and boats; making sails, awnings, and the like, and improving the methods and means of storing, inspecting, and handling the supplies and keeping the accounts of the same.

In the matter of keeping the store accounts several important and necessary improvements were made.

The more special work done at the depot was the outfitting and equipment of the supply steamer *Armeria*, the tender *Azalea*, and the new light-ship No. 48 for Sandy Hook, to prepare them for service.

These operations, embracing the final changes, additions, and adjustments which all new vessels require, called for and received the labor and materials which the shops and stores of the depot were able to supply.

The need for enlarging the facilities of the depot for the reception, handling, and care of supplies, oil, and other stock is more pressing every year, until now it is imperative to provide larger and better accommodations.

The storehouse was built in 1864, when space was required for only 2,600 packages of supplies of all kinds. In 1885 the number of packages stored was 5,600.

In the past year space had to be made by building tiers and overcrowding for 7,800.

These last figures do not include packages containing paints, paint oil, chimneys, etc., which are stored in buildings apart from the main storehouse.

The oil house on the dock was built in 1881, and held with safety 25,000 cases of mineral oil. Storage is now required for 60,000 cases. It is strongly urged, therefore, to remove the coal sheds from their present site to the southern end of the water front, and then to enlarge the oil house to an ample size and strengthen it for use in every part.

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The storehouse proper should be enlarged to nearly twice its present size, which would require the removal of its adjuncts to other sites. One of these would require the ground occupied by the small house near the north wharf, now used by the Revenue Marine as a receptacle for condemned stores. In any event the space so occupied is needed for the depot, where every foot is indispensable for the work to be done.

Ice house.—On account of the high rate charged and the inconvenience of procuring ice for the preservation of fresh provisions, etc., for the use of the light-house tenders, supply vessel, and depot, it was found necessary to provide an ice house. For this purpose one of the casemates of the old oil vault, with a capacity of 250 tons, was fitted up. A closet was furnished with meat hooks, shelves, etc., for each tender, for the supply steamer, and for the depot.

Sea wall.—Under the existing contract of June 28, 1888, a sheet-pile cofferdam was built on the north face, and turning the corner, 14 feet 10 inches on the east face. The mud is mostly pumped out, and the work of filling with concrete to receive the superstructure of cut stone is under way. Plans and specifications for removal and rebuilding of a portion of the north wharf and dredging the basin as enlarged were prepared. A contract was made for furnishing cut stone and backing for building a retaining wall from the present stone bulkhead northerly to the new sea wall. To complete the east face of the sea wall 160 feet to the opening, remove and rebuild the remainder of the north wharf as contemplated, will require \$40,000, and it is recommended that an appropriation of this amount be made therefor.

New London, Conn.—A stock of fuel, buoys, and appendages, anchors, lime, mineral oil, and cleansing materials sufficient for emergencies is kept at this depot. Relief light-ship No. 17 is kept here for short temporary service. The wharf was repaired and some dredging was done at this depot.

Goat Island, Newport Harbor, Rhode Island.—There is kept in the shed here a supply of coal for the stations in the vicinity and for the tenders when they are working in that part of the district. Buoys and appendages and mushroom anchors to meet emergencies are kept on the wharf. Small repairs were made on the shed.

Juniper Island, Lake Champlain, Vermont.—An appropriation of \$2,500 was made by Congress March 3, 1891, for establishing a light-house and buoy depot at this point. The work will be commenced as soon as practicable.

TENDERS.

The Fern.—On the return of this steamer from her autumn voyage on September 6, 1890, everything serviceable, with the exception of rigging, side lights, compasses, and two boats was removed from her, and on January 30, 1891, she was turned over to the Navy Department,

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and taken from the light-house depot to the New York navy-yard. She delivered the annual supplies from St. Croix River, Maine to Robbins Reef, New York, inclusive; steamed 3,000 miles, and consumed 159 tons of coal.

The Armeria.—The construction of this vessel was finally completed by the contractor, and after her successful trial trip she was accepted on December 5, 1890. The following is a synopsis of the trial trip: She left the dock at Camden, N. J., on December 2, at 2 o'clock p. m., for the light-house depot, Staten Island, and arrived there December 4, 1890, at 6:30 p. m. An accident to the steering gear obliged her to put into New Castle, Del., and come to anchor. Twelve hours were lost in this way. The record in average figures gave: Pressure, 92 pounds; revolutions, 96; vacuum, 28.5, and speed 13 knots. The engines worked satisfactorily; the boilers showed a capacity for carrying 100 pounds of steam; not one bearing was heated, and no vibrations were perceptible. The result gave entire satisfaction. Of her performance during her first voyage the master's report stated that while crossing the Gulf from Brazos to Key West a severe northerly gale was encountered and the seas were heavy, in which trial the vessel showed excellent seagoing qualities. After acceptance, her cargo of light-house supplies was put on board, and with a full complement of officers and men, she left the Staten Island depot for her first trip on December 22, 1890, and returned on March 16, 1891. She started again on April 21, and returned on June 18, 1891. In both trips she supplied all the light-stations from Elbow Beacon, New Jersey, to Point Isabel, Texas, inclusive. The deliveries embraced 187,120 gallons of mineral oil; 150 tons of paints, oils, and turpentine; 1,200 boxes of chimneys; 3,000 packages of "wrapper goods," and 15 tons of miscellaneous stores. In addition, she carried to the depots of the several districts in her route large quantities of buoys, chains, sinkers, paints, oils, and other articles of contingent supply. She steamed 10,600 miles and consumed 1,089 tons of coal. She uses the steam launch of the old supply steamer *Fern*, which, after the summer voyage, will be wholly unfit for service or repair. A new launch is being built for the *Armeria*.

The Azalea.—A full description of this steamer was given in the annual report of last year. Since July 1, 1890, the work of construction done on this vessel was as follows:

The plating, with the exception of the garboard strake, keel strake, and one bilge strake, was fitted, riveted, and calked. One-fourth of the deck beams, one-half of the bulkheads, two-thirds of the keelsons, the bilge keels, all the decks and ceiling, all the joiner work, the ballast tank aft, engine and boiler foundations, etc., were built and fitted in the vessel.

All masts and spars, standing and running rigging, derricks, sails, and awnings, were made and fitted. Main and donkey boilers were

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built, put in, connected, and covered. About four-fifths of the engine and all pumps and drainage of the vessel were put in. Anchor windlass, two steam hoisters, and all fittings about decks and elsewhere were fitted. She was launched on November 29, 1890, made her official trial trip June 10, and was formally accepted June 18, 1891. After her arrival at the general light-house depot at Staten Island her equipment was made complete, her supplies and provisions were put on board, and she left on June 23 for the light-house depot at Woods Holl, Mass., where she arrived on June 25, 1891. The report of her trial trip was as follows:

Pressure, 103 pounds; revolutions, 105; horse power, 446; speed, 11.75 knots.

On her arrival at Woods Holl depot, the master reported that the *Azalea* had worked well, but that the engine had not yet done its best work.

The John Rodgers.—This steamer was kept very busy throughout the year, except for thirty-one days when she was laid up for repairs. She changed or replaced 251 buoys, painted 296, and repaired 31, and was eighteen days employed in attending to the electric buoys. She was occupied for seventy-six days on tours of inspection; thirty-six days in delivering supplies, rations, and fuel to light stations; eighty-one days at the general depot painting buoys and storing supplies; and for nine days serving the Romer gas beacon, New York Lower Bay, and attending to the day beacons in her section of the district. The other working days of the year were occupied in changing and replacing buoys, lighting wrecks, and similar work. She steamed 7,256 miles and consumed 545 tons of coal. The main cylinder bottom, the buoy engine, and air-pump bucket were repaired; a new foot valve was fitted; the main piston was taken out and replaced, and the piston rod was refitted and fastened. She was hauled out on the railway in July, 1890, when her bottom was cleaned and painted. The forecastle and after cabin were taken out at the light-house depot; the hull was scraped and painted, and the joiner work was replaced. The engine generally is in good condition and will probably require no extensive repairs during the present fiscal year. The boiler is about eight years old and has not yet had any extensive repairs. With some patching it can probably be made to run through the year. The wear of this boiler, owing to good care, has been slow. Its general condition is so good that, with renewal of the bottom of the legs and some patching, three or four years' service may be had from it. During the year the *John Rodgers* received paints, locks, rope, medicines, new wheel chains, bedding, cooking utensils, grate bars, engineer supplies, ship chandlery, provisions, and fuel.

The Cactus.—This steamer was actively employed during the year. She changed or replaced 255 buoys and put down 11 new ones; delivered to light-houses, light-vessels, and fog-signal stations 494 tons of

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coal and 19 cords of wood; conveyed the inspector to 134 stations; made 84 deliveries of supplies and 44 deliveries of rations, and made 3 changes of light-ships. All the buoys and appendages at the New London and Newport depots were cleaned and painted by the vessel's crew. In doing her work she steamed 8,533 miles and consumed 452 tons of coal. Her principal repairs consisted of changing and fitting the water wheels; new copper pipe for the feed pump; altering the exhaust toes for the valve motion; new composition boxes made and fitted to the crank pin, outboard shaft journal, and for the upper end of the front links and air-pump links. Since the alteration of the water wheels and the valve motion the operation of the engine has been much improved. The boiler is quite tight. The *Cactus* was hauled out at New London, the paddle boxes were reduced in size, the joiner work and bulkheads were repaired, and the gangways were calked. She received during the year rope, oars, blocks, paint, wheel chains, crockery, provisions, and fuel.

The Gardenia.—This steamer was constantly employed carrying freight between the general depot and the various lines of transportation in New York Harbor, and in making tours of inspection and delivering supplies. The *Gardenia* placed or replaced 110 buoys and painted 160; changed the electric buoys 11 times and repaired them 50 times. She delivered 264 tons of coal and 11 cords of wood, and performed sundry other duties, such as lighting wrecks and the like. In this work she steamed 6,416 miles and consumed 318 tons of coal. She was laid up forty-two days for repair, when she was hauled out on the railway, cleaned, and painted, and received a new boiler. The vessel received during the year packing, gaskets, crockery, grate bars, crane chain, engineer stores, provisions, and fuel.

The Putnam.—This steamer did duty as a buoy tender until March 6, 1891, when she was transferred to the seventh light-house district and sailed for Key West. She was hauled out on the railway in March, 1891, six strakes of plank were put on the bottom on each side of the keel to strengthen the hull under the boiler and engine, sponsons were put on forward of the wheels, and new metal was put on over the new plank.

Naphtha Steam Launch Bouquet.—This vessel failed to give satisfaction, as she is too small for the duties required of her, and is unserviceable except in good weather and smooth seas. Her machinery was too frail, and she was unsafe with the use of naphtha for fuel. The purchase of a larger vessel with a coal-burning boiler was deemed desirable, but as funds for such an outlay were not available, a coal-burning boiler was put into the *Bouquet*.

The Mistletoe.—This steamer was constantly employed on works of repair throughout the entire year, but she is in as good condition as

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could be expected in a boat of her age. During the year she ran 7,970 miles and consumed 493.4 tons of coal.

The Grace Darling.—This steamer was constantly employed on works of repair and construction. Some damage was done to her copper and machinery when she was caught in the ice while establishing the fog signal at Esopus Meadows, Hudson River, New York. During the year she ran 6,684 miles and consumed 264.4 tons of coal.

The Nettle.—Some repairs were made to the boiler and hull of this steam launch. She was mostly employed on repairs in Lake Champlain and Hudson River. During the year she ran 3,460 miles and consumed 41 tons of coal.

FOURTH DISTRICT.

The fourth district extends from Shrewsbury River, New Jersey, to and including Metomkin Inlet, Virginia, and embraces all the aids to navigation on the seacoast of New Jersey below the Highlands of Navesink, on the Delaware Bay, the Delaware and Schuylkill Rivers, the seacoasts of Delaware and Maryland, and part of the seacoast of Virginia.

Inspector.—Commander Purnell F. Harrington, U. S. Navy.

Engineer.—Capt. Frederick A. Mahan, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights.....	56
Light-ships in position.....	4
Day or unlighted beacons.....	5
Fog signals operated by steam or hot-air engines.....	4
Fog signals operated by clockwork.....	7
Whistling buoys in position.....	4
Bell buoys in position.....	5
Ice buoys for winter use.....	10
Other buoys in position.....	168
Steamer <i>Zizania</i> , buoy tender and for supply and inspection.....	1

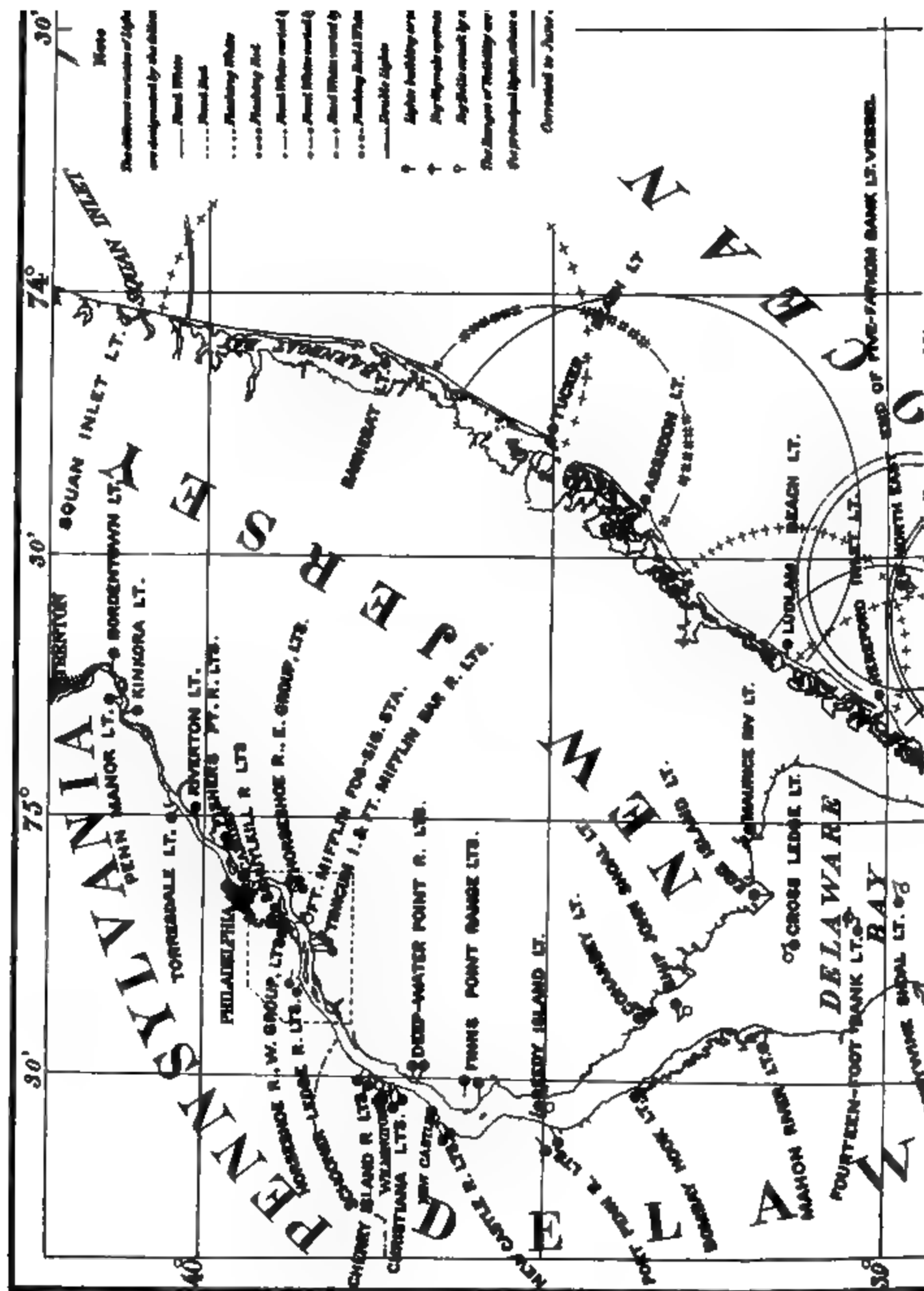
LIGHT-HOUSES.

314. *Squan Inlet, seacoast of New Jersey.*—The title papers for the purchase of the site for this light were completed, but before payment was made the lot was located from the description given in the deeds, when it was found that the lot to be transferred was not the site selected and agreed upon by the Light-House Board and was totally unfit for light-house purposes. The owners have consequently been notified that the sale will not be completed.

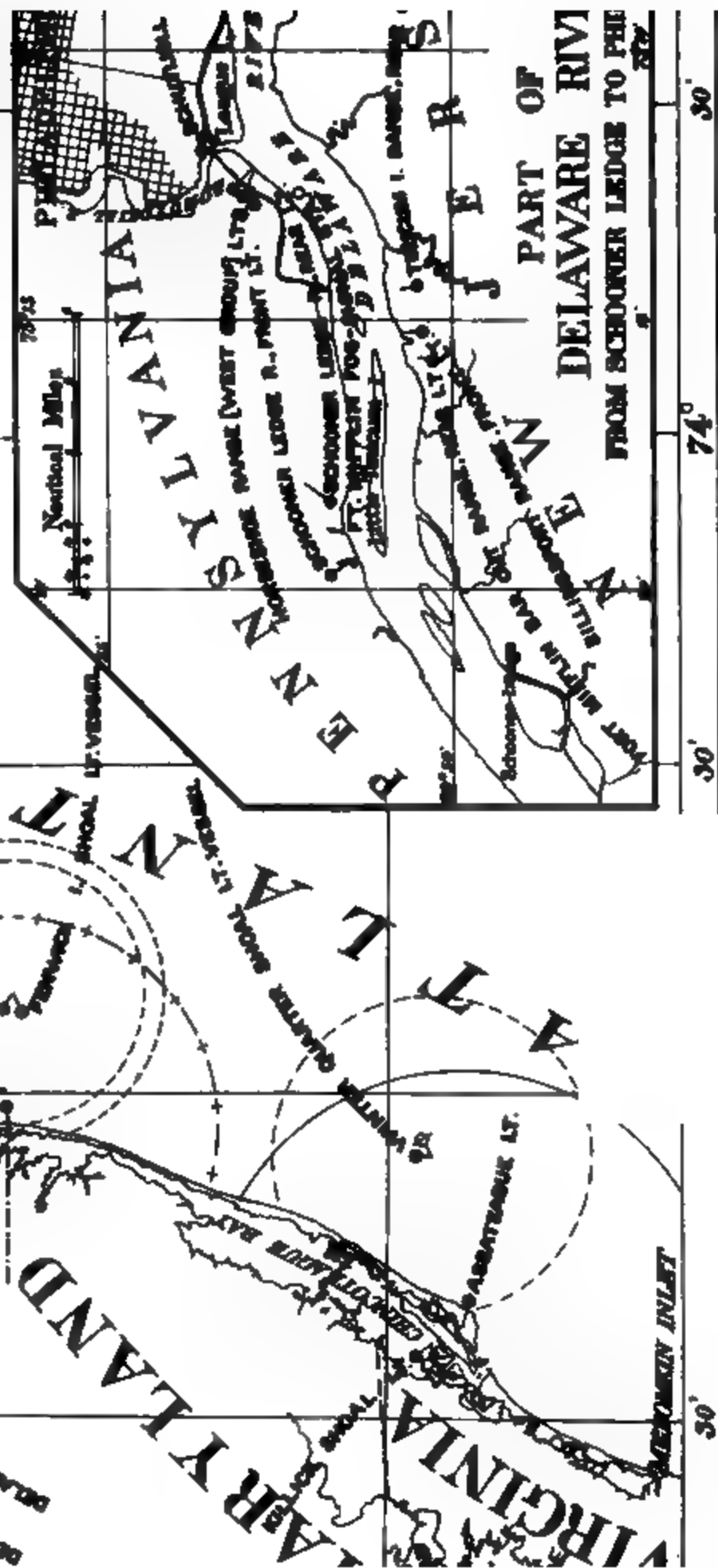
315. *Barnegat, seacoast of New Jersey.*—A detached brick oil-house was built and various repairs were made. New quarters for the assistant keepers are urgently needed at this station. The second assistant keeper has no quarters except one room which he occupies in the quarters of the first assistant keeper. Another dwelling should be erected at this station so that the keepers can live with their families in at least as much comfort as can be had by skilled workmen in cities.

It is estimated that a proper structure can be erected for \$4,000, and it is recommended that an appropriation of that amount be made for this purpose.

316. *Tucker Beach, entrance to Little Egg Harbor, seacoast of New Jersey.*—The site was filled in and graded, a portion of it sown with



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Fourth District.

grass-seed, and the boundary fences were renewed. A frame addition was built to the dwelling, and the stable was rebuilt.

317. *Absecon, Absecon Inlet, seacoast of New Jersey.*—Repairs at this station have consisted principally in improving the site and its inclosure. The unsightly grass stubble covering the reservation has been removed, the grounds plowed up, given a top dressing of loam and manure, and seeded. The wooden fence, which was in constant need of repair, was removed and replaced with a raised concrete curb on a concrete foundation. The gravel sidewalks on three of the fronts were filled in and brought up to city grade and faced with stone curbing.

An additional hydrant was furnished for the use of the assistant keeper's dwelling, the brick and flag walks were raised, and minor repairs were made to the dwellings and outbuildings.

Two of the jetties in front of the station are being lengthened for the further preservation of the site.

The assistant keepers are crowded in a building about 25 feet square, so planned that it is impossible to have any privacy. From this cause, during the heat of summer, the keepers are subject to great inconvenience and discomfort. Another building should be erected at this station so that the keepers can live with their families in at least as much comfort as can be had by skilled workmen in cities.

A keeper's dwelling sufficient for their accommodation can be erected for \$4,000, and it is recommended that an appropriation of this amount be made for that purpose.

318. *Ludlam Beach, Sea Isle City, seacoast of New Jersey.*—The site of this station is in urgent need of protection from the action of the sea, and the pile revetment should be extended to take in the rear of the lot. Various repairs were made.

319. *Hereford Inlet, seacoast of New Jersey.*—The low places on the reservation were filled in and the whole was graded and seeded. The sidewalk in front of the station was faced with stone curbing, the stable was rebuilt, and the fences were renewed.

322. *Cape May, north side of entrance to Delaware Bay, seacoast of New Jersey.*—This tower was struck by lightning on June 12, 1891. The lightning struck the ball on the dome of the tower, followed down the framework of the lantern, leaped from the pedestal of the lamp to the iron of the watchroom, passed around by the iron gallery to the lightning rod, and thence a part of the current was carried by the electric call bells into the keepers' dwellings, causing much damage to the interior. These damages were repaired and a new set of call bells, wires, etc., was substituted.

Additional windows were put in the assistant keepers' dwelling and a summer kitchen was added. The chimneys of both dwellings were rebuilt.

Fourth District.

— *Big Oyster Beds, mouth of Maurice River, Delaware Bay, New Jersey.*—The following recommendations made in the Board's last three annual reports are renewed:

It would be largely to the interests of the oyster men of Maurice River to establish a light and fog signal at or near the southern edge of Big Oyster Beds. It would be desirable also to place a beacon light, with a lantern on it which will burn eight days, to mark the entrance to the river. The light on Big Oyster Beds should be erected on a strong foundation, to resist the push of floating ice, and would cost, it is estimated, about \$25,000. The beacon light at Elder Point could be built for about \$100. On the exhibition of these lights the Maurice River light could be discontinued.

It is recommended that appropriations of these amounts be made therefor.

324. *Delaware Breakwater (east end), entrance to Delaware Bay, Delaware.*—A pair of iron boat davits were put in position on the wharf.

325. *Delaware Breakwater Range (front), west end of Breakwater, south side of entrance to Delaware Bay, Delaware.*—A new wharf with new steps to the lantern gallery, new landing steps and two sets of boat davits, a coal and oil shed were built, and various repairs were made.

327. *Mispillion Creek, Delaware Bay, Delaware.*—Damages to the bulkhead and banks, by the storm of October, 1890, were repaired, the height of the bank was increased and the banks were protected with stone riprap and facing. The site was partially filled with gravel and graded, and repairs were made to the board walks. A small frame kitchen was added to the dwelling and the frame stable was rebuilt.

333. *Mahon River, Delaware Bay, Delaware.*—The front of the site was protected by a pile and sheathing revetment, with returns of 30 feet on each side, backed by stone resting on brush mattresses. The roadway was resurfaced with oyster shells, two communicating doors were placed in the dwelling, and the stable was rebuilt.

336. *Bombay Hook, mouth of Duck Creek, Delaware Bay, Delaware.*—The brick kitchen attached to dwelling was removed and replaced by a two-story frame addition, and various repairs were made. The fences were rebuilt and the brick walks were relaid and lengthened.

338. *Port Penn Range (rear), below Port Penn, Delaware River, Delaware.*—Minor repairs were made to the drain, cistern, and dwelling and to the base of the tower. The frame barn was rebuilt.

342. *New Castle Range (front), below New Castle, Delaware side of river, Delaware.*—An outkitchen was built, the barn was rebuilt, and various repairs were made.

345. *Deep-Water Point Range (rear), below Deep-Water Point, Delaware River, New Jersey.*—The frame barn was rebuilt and various repairs were made.

Fourth District.

346. *Christiana Beacon, on pier end of jetty at mouth of Christiana River, Delaware.*—Contract was made for extensive repairs to the keeper's dwelling.

347. *Christiana, mouth of Christiana River, Delaware.*—The cross banks and those on the river front were repaired. The old wooden bridges were removed from over the ditches, and earth banks, built over terra-cotta sewer pipes, substituted. A contract was made for extensive alterations and repairs to the dwelling, to make it habitable.

348. *Cherry Island Range (front), above Edgemoor Iron Works, Delaware side of river, Delaware.*—The frame stable was rebuilt and various repairs were made.*

349. *Cherry Island Range (rear), above Edgemoor Iron Works, Delaware River, Delaware.*—A well was dug and furnished with a pump, and inclosed for supplying the station with water, and the fences were removed.

350. *Schooner Ledge Range (front), mouth of Crum Creek, Pennsylvania.*—The outside kitchen was connected to the dwelling, and a boat-house was built. The stone wall on the river was taken down and rebuilt for a length of 200 feet.

351. *Schooner Ledge Range (rear), in Derby Creek Valley, Pennsylvania.*—A frame kitchen addition was built to the dwelling, the repairs to the floor and the steps of the tower were completed, and the stable was rebuilt.

352. *Billingsport Range (front), Delaware River, New Jersey.*—The frame barn and the boundary and cross fences were rebuilt, and the steps and drain of the slope on the river front were renewed.

354. *Fort Mifflin Bar Cut Range (rear), Delaware River, New Jersey.*—A new brick walk from the dwelling to the tower was laid, the lattice work at the base of the tower was renewed and the fences were rebuilt. The frame tower was resheathed and repaired to prevent leakage from driving storms.

356, 357, 358. *Horseshoe Range (west group), on Fort Mifflin Reservation, Delaware River, Pennsylvania.*—The raised foot walk from the dwelling and the rear beacon to the front beacons on the river bank, 1,600 feet long, and the frame barn, were rebuilt and various repairs were made.

359, 360, 361. *Horseshoe Range (east group), Delaware River, New Jersey.*—The frame tower of the rear beacon was sheathed from top to bottom with shingles. A kitchen addition, with pump and sink, was built, the stable was rebuilt and various repairs were made.

362, 363. *Schuylkill River Range (front and rear), mouth of Schuylkill River, Pennsylvania.*—The cellar floor of the dwelling was raised and laid with concrete and the frame stable was rebuilt.

* The keeper's dwelling at this station was destroyed by fire on August 8, 1891. Measures were taken at once to rebuild the structure.

Fourth District.

372. *Fenwick Island, on the coast 20 miles south of Cape Henlopen, Delaware.*—The stable was rebuilt and various repairs were made.

374. *Assateague, seacoast of Virginia.*—A new iron door, leading from the watchroom to the gallery, was hung, the fences and plank walks were renewed, a brick oil house was built, and various repairs were made. The assistant keepers are living at this station in two rooms each. In these rooms they perform all the ordinary acts of life, such as sleeping, dressing, eating, and cooking in the winter. New quarters should be built at this station, so that the assistant keepers can live decently with their families, let alone having at least as much comfort as can be had by skilled workmen in cities. It is estimated that suitable quarters for the keeper can be erected for \$4,000, and it is recommended that an appropriation of this amount be made for that purpose. The quarters now occupied by the keeper will then be available for one of the assistants.

REPAIRS.

At each of the following-named stations repairs and renovations, more or less extensive, were made during the year:

323. Cape Henlopen, Del.	337. Port Penn Range (front). Del.
326. Delaware Breakwater Range (rear), Del.	339. Reedy Island, Del.
328. Brandywine Shoal, Del.	340. Finns Point, front range, N. J.
329. Fourteen-Foot Bank, Del.	341. Finns Point, rear range, N. J.
330. Maurice River, N. J.	343. New Castle, rear range, Del.
331. Egg Island, N. J.	353. Tinicum Island, rear range, N. J.
332. Cross Ledge, N. J.	375. Killick Shoal, Va.
335. Cohansey, N. J.	

LIGHT-SHIPS.

320. *Northeast end of Five-Fathom Bank Light-Vessel, No. 44, off the seacoast of New Jersey.*—The boilers for the steam fog signal failed in September, 1890, and the bell was used. The vessel was brought in for repair and to receive her new boilers on December 10, 1890. The station was marked meantime by a whistling buoy, and, on December 24, schooner *S. S. Hudson* was placed on the station as a temporary light-ship. Two new steel boilers were placed in light-vessel No. 44. Two new mooring hawse pipes, a new mainmast, a set of deck awnings, and a suit of sails were supplied for the launch. Minor repairs were made to the machinery and hull. Two consolidated pop safety-valves were supplied and fitted. After the new boilers were put in and the repairs completed, the vessel was taken out on the dock, where the bottom was thoroughly cleaned and painted with two coats of germicide paint, when she was taken to the Edgemoor supply depot, where the mooring chains were overhauled, and parts well worn were cut out, and new chain was substituted. Supplies and fuel were put on board and on February 15, 1891, the vessel was returned to her station.

Fourth District.

When light-ship No. 44 was replaced on her station, the schooner *S. S. Hudson* and the whistling buoy were removed.

NOTE.—The schooner *S. S. Hudson*, having been chartered for use as a temporary light-vessel, was towed to the Edgemoor light-house depot and fitted with chains, anchors, lanterns, and the like. When in readiness for service, she was towed by the light-house tender *Zizania* and placed on the Northeast End light-station, on December 24, 1890, where she remained, doing good service until February 15, 1891, when she was removed and towed back to Philadelphia, by the *Zizania*. After all the articles of supply and outfit belonging to the Light-House Establishment were removed, the schooner was turned over to her owners on February 16, 1891.

321. *Five-Fathom Bank Light-Vessel, No. 40, off the seacoast of New Jersey.*—The boilers for her steam fog signal failed in December, 1890, and the bell was rung during fog until April 30, 1891, when the vessel was brought in to receive new boilers and necessary repairs. The station was marked by the schooner *Drift* and a whistling buoy. Light-ship No. 40 was placed in the hands of the contractors, who removed the old and put in her new boilers and made necessary repairs to the steam pipes and machinery.

The hull of the vessel was calked from the metal up to the plank sheer. The bolts in the rudder braces were renewed, the gallows frame for the boats was raised and repaired, and repairs were made in the forecastle. Two consolidated pop safety-valves were furnished and fitted. When the work of putting in new boilers, etc., was completed the vessel was taken to the Edgemoor light-house depot, her mooring chains were overhauled and renewed where necessary, supplies were placed on board, and the vessel was towed to her station by the light-house tender *Laurel*, on June 4, 1891. The schooner *Drift* and the whistling buoy were removed and brought to the Edgemoor light-house depot.

371. *Fenwick Island Shoal Light-Vessel, No. 37, off the seacoast of Maryland.*—The force-pump was repaired. Rations, annual allowances, 12 gallons of deck paint, 10 tons of coal, 2 cords of wood, 1 wind sail, 1 cooking stove, pipe, rope, nails, etc., were supplied. Ten light-ship lamps and ten reflectors were supplied from the general light-house depot.

373. *Winter-Quarter Shoal Light-Vessel, No. 45, off the seacoast of Virginia.*—New tubes were supplied for each boiler of the fog signal, an expander was furnished, and the work of putting in the tubes was done by the engineers of the vessel. Medicine, rations, annual allowance, 2 cords of wood, stoves for cabin and forecastle, rope, metal, bolts, nuts, paint, and waste were supplied. The marine clock was repaired. New windlass brakes and block and fishhook for working the anchors were furnished.

FOURTH DISTRICT.

district extends from Shrewsbury River, New Jersey, to Metomkin Inlet, Virginia, and embraces all the aids to the seacoast of New Jersey below the Highlands of Nave- Delaware Bay, the Delaware and Schuylkill Rivers, the Delaware and Maryland, and part of the seacoast of Vir-

-Commander Purnell F. Harrington, U. S. Navy.

-Capt. Frederick A. Mahan, Corps of Engineers, U. S.

istrict there are—

ed beacon lights.....	56
osition.....	4
d beacons.....	5
rated by steam or hot-air engines.....	4
rated by clockwork.....	7
s in position.....	4
osition.....	5
inter use.....	10
position.....	168
y, buoy tender and for supply and inspection.....	1

LIGHT-HOUSES.

Inlet, seacoast of New Jersey.—The title papers for the he site for this light were completed, but before payment a lot was located from the description given in the deeds, found that the lot to be transferred was not the site se- reed upon by the Light-House Board and was totally unfit se purposes. The owners have consequently been notified will not be completed.

gat, seacoast of New Jersey.—A detached brick oil-house l various repairs were made. New quarters for the assist- are urgently needed at this station. The second assistant o quarters except one room which he occupies in the quar- st assistant keeper. Another dwelling should be erected m so that the keepers can live with their families in at t comfort as can be had by skilled workmen in cities. ted that a proper structure can be erected for \$4,000, and ended that an appropriation of that amount be made for

Beach, entrance to Little Egg Harbor, seacoast of New site was filled in and graded, a portion of it sown with

Fourth District.

inadequate to properly accommodate and secure the tender while lying there.

Edgemoor supply and buoy depot, Delaware River, Delaware.—The work of arranging the depot and classifying the material has received attention and the depot is in fair condition. The basin was dredged and 7,500 cubic yards of mud, etc., were removed. To give it the depth of water necessary for the free movements of the vessels using it will require the removal of at least 8,000 yards additional.

Cape May, New Jersey.—An appropriation of \$750 was made by the act approved on October 2, 1888, for the purchase of a site and the erection of a boathouse for light-ships' boats at this place. The purchase of the site for a boathouse has been completed, and it is found that the balance of the appropriation is insufficient for the erection of a suitable structure. It is estimated that this work can be done for \$800 and recommendation is made that an appropriation of this amount be made for that purpose.

TENDERS.

The Zizania.—The ventilator to the forecastle of this steamer was altered to increase the ventilation. Spray pipes, of brass, for cooling the engine bearings, were furnished and fitted. On October 23, 1890, she was taken on the dock and the bottom was thoroughly cleaned and painted with two coats of germicide paint. Her bottom was found to be in good condition, as was the red and white lead paint put on December, 1889. In March, 1891, the tender was again hauled out, the composition propellers and bearings were removed, and iron ones were substituted. Upon examination of the paint on the bottom it was found that the germicide paint, put on in October, 1890, was worn off in many places. Six gallons of paint were purchased and the bottom touched up where necessary. The tender was engaged in attending to the buoyage of the district, towing light-vessels to and from stations, delivering fuel and supplies to light-houses, etc. Two trips were made to the general depot, at Tompkinsville, N. Y., for supplies, buoys, and for the schooner *Drift*. The tender was on duty throughout the year, except the seventy-six days during which she was laid up for repairs.

She replaced 28 buoys; changed 101; painted 136; and placed 7. She also painted Christiana gas beacon, the Fort Mifflin fog-signal tower and house, and Fishers Point post-lights. She landed 107 tons of coal and 9 cords of wood at twenty-one light-stations, and 128 tons of coal and 8 cords of wood at four light-vessels. Her crew were at work fifty days at Edgemoor supply and buoy depot. She delivered the annual allowance of provisions to four light-vessels and eleven light-stations. She also conveyed the inspector to the light-stations of the district, for the purpose of inspecting, and she delivered the necessary supplies to the stations. In doing this work she steamed some 10,243

Fourth District.

miles, and consumed about 747 tons of coal. In May last, while steaming down the Delaware River at moderate speed, the crank of the port low-pressure engine broke and the bedplate cracked. Upon examination it was found that the forging was defective. The vessel was taken to Wilmington, Del., where she was repaired, and was again in commission on June 30, 1891. Necessary supplies, such as rope, oil, etc., were furnished.

The Drift.—This schooner, belonging to the Coast and Geodetic Survey, was turned over to the Light-House Establishment for temporary duty as a light-vessel. The tender *Zizania* towed her from the general light-house depot, Tompkinsville, N. Y., arriving with her at the Edgemoor supply and buoy depot on March 31, 1891. Minor repairs were made to the hull and the deck was painted. The schooner was moored on Five-Fathom Bank, April 30, 1891, in place of light-vessel, No. 40.

The Laurel.—This steam tender arrived from Pensacola, Fla., at Edgemoor supply depot for repair, in May. On account of the accident to the tender *Zizania*, the *Laurel* was employed to place buoys; take rations to the light-vessel, the *Drift*, on Five-Fathom Bank station; convey the inspector on inspection duty of light-stations; tow light-vessel No. 40 to her station, Five-Fathom Bank; remove the whistling buoy and schooner *Drift*, and bring her to the Edgemoor supply depot. On June 16 the steamer was hauled out on the marine railway at Wilmington, Del., the metal was stripped off from the bottom, and a thorough examination made of the hull and machinery. She was launched June 25, and proceeded to Edgemoor supply depot. On June 30 she was taken to a yard in Wilmington, Del., for the purpose of being repaired by contract.

FIFTH DISTRICT.

The fifth district extends from Metomkin Inlet, Virginia, to include New River Inlet, North Carolina, and embraces part of the seacoasts of Virginia and North Carolina, all of Chesapeake Bay, the sounds of North Carolina, and the rivers tributary thereto.

Inspector.—Commander Charles J. Train, U. S. Navy.

Engineer.—Capt. John C. Mallery, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights.....	104
Light-ships in position.....	1
Day or unlighted beacons.....	13
Fog signals operated by steam or hot-air engines.....	2
Fog signals operated by clockwork.....	64
Whistling buoy in position.....	1
Bell buoys in position.....	2
Other buoys in position, including pile buoys and stakes.....	1, 134
Steamers <i>Holly</i> and <i>Violet</i> , buoy tenders, and for supply and inspection.....	2
Steam-launch <i>Bramble</i> , used to supply gas to the beacons in the sounds of North Carolina.....	1
<i>Sharpie</i> (and gas tank), for supplying beacons and coast stations.....	1
Steamers <i>Jessamine</i> and <i>Thistle</i> , for construction and repair.....	2

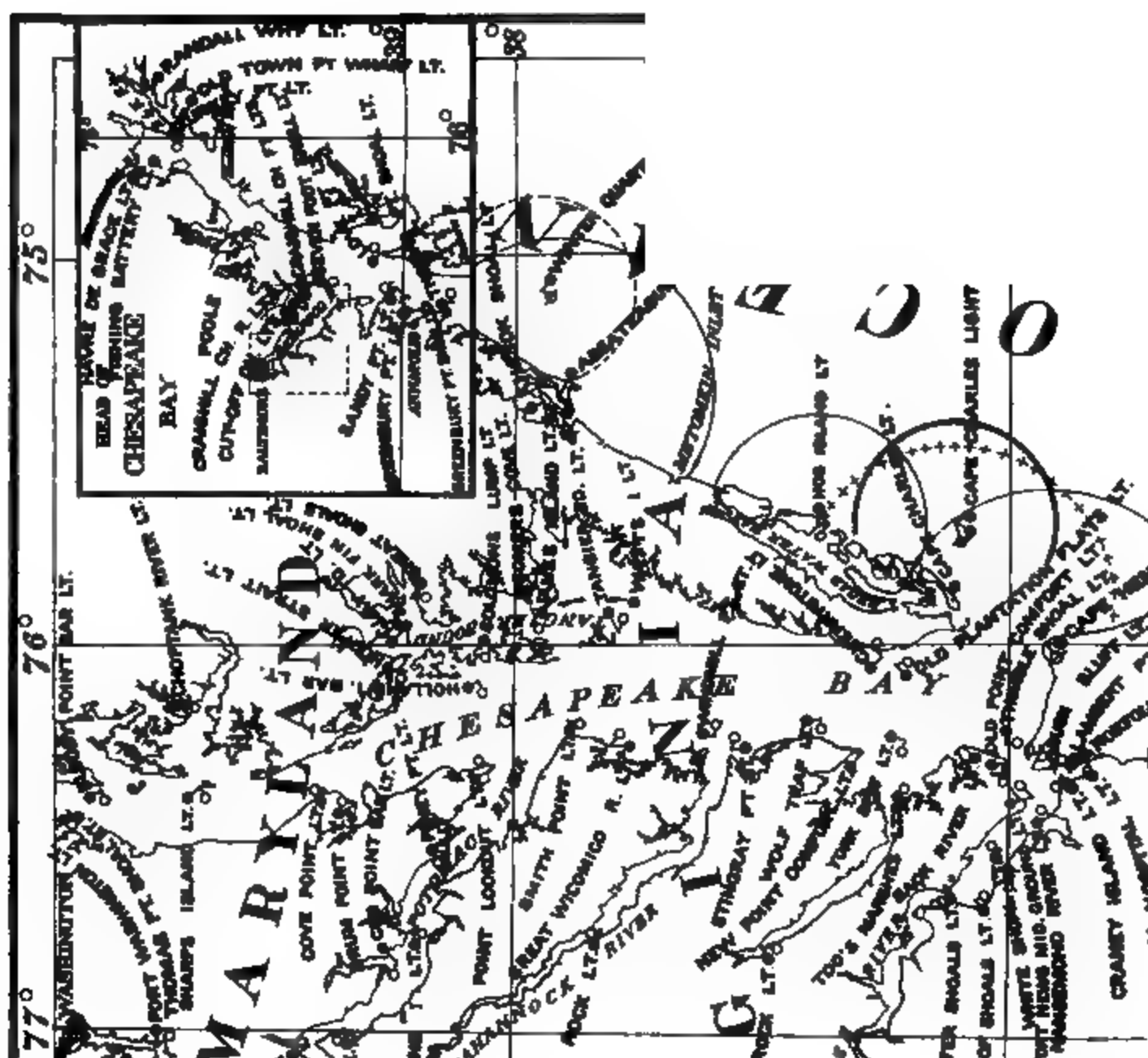
LIGHT-HOUSES.

376. *Hog Island, Great Machipongo Inlet, seacoast of Virginia*.—In August the cistern was repaired and a new pump was furnished. The authority asked of Congress for the purchase of the land required for the site of the wharf, and right of way for the road to be built at this station, was granted by act of March 3, 1891. Arrangements are now being made for the acquisition of the necessary property. Various repairs were made. The following recommendation made in the Board's annual reports for each of the last four years is again renewed:

This is of little advantage except to vessels running close alongshore. The Board recommends, in order to increase its efficiency as a coast light, the substitution of a first-order light for the present fourth-order light. There are unlighted gaps between this light and Assateague on the north and Cape Charles on the south of about 5 miles and 2 miles, respectively, which a first-order lens, placed on a tower 150 feet high, would illuminate. Its range of visibility, which would be more than 18 miles, would intersect the Assateague Light in 18 fathoms of water. A first-order light on that island would be of great assistance to vessels trading on that coast. It is estimated that a first-order light can be substituted for the present fourth-order light at Hog Island at a cost of \$125,000.

It is recommended that this amount be appropriated therefor.

378. *Cape Charles, on Smith Island, entrance to Chesapeake Bay, seacoast of Virginia*.—The work of building the jetties and shore protection was continued with but little result until late in the fall, as mos-



Fifth District.

quitos were so numerous and troublesome as to practically cause a suspension of operations. In November, all of the piles for the work had been driven. In January, the last jetty had been completed, but it was not until March 11 that the protection wall was finished, owing to delays caused by the difficulty of obtaining stone. The wharf for landing material built by the contractors was washed away three times during heavy storms, and one vessel chartered to carry stone was wrecked and another badly injured while engaged in this work. The design for the new tower has not yet been decided upon. Test borings were made at the site, which indicated clean, sharp sand to a depth of 27 feet, at which point the boring terminated. A plat of the land needed for the new site was made, and negotiations for its purchase are now in progress.

380. *Thimble Shoal, north side of channel to Hampton Roads, Virginia.*—The gutters and spouting were renewed in July. On the night of March 15, 1891, the light-house was considerably damaged by the running against it of an unknown steamer. One end of the main gallery was badly injured and one of the iron girders was broken. The station was promptly repaired.

381. *Old Point Comfort, entrance to Hampton Roads, Virginia.*—Extensive repairs and renovations were made by a working party in April, May, and June. The dwelling, which was very old and beyond economical repair, was rebuilt; new outbuildings, including a stable, 25 feet by 14 feet in plan, were constructed; 276 lineal feet of iron and 420 lineal feet of wooden fencing were put up; the tower was scraped, pointed, and painted, and other minor repairs were made.

383. *Craney Island, mouth of Elizabeth River, Virginia.*—In July and August a new wooden platform was built under the house for the storage of fuel; a new main-gallery post was put up to replace one broken by a passing vessel; new inflow pipes for the water tanks were put in. Various repairs were made.

386. *Newport News Middle Ground, Hampton Roads, Chesapeake Bay, Virginia.*—In July the wooden caisson with four sections of the dredging shaft and two courses of the foundation cylinder was towed to the site and sunk. The building up of the structure was then carried forward with satisfactory progress. By the end of October the fifth course of plates had been placed on the cylinder and the caisson had reached the depth designed—the stratum of clean, white sand 34 feet below the surface of the shoal. The concrete filling having meanwhile been gradually deposited and in December having reached the proper height, the work of erecting the iron superstructure which had been delivered at the buoy depot, Portsmouth, Va., in August, by the contractors, was commenced. It was completed in January, including the brick lining. The rest of the work required by contract was finished on March 6, 1891,

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when the light-house was formally accepted. During its construction about 1,000 tons of riprap stone were placed around the structure as a protection from the undermining action of the currents. On April 15, 1891, the light was first exhibited from the lens for the benefit of mariners. It is fixed white of the fourth order, varied by a white flash every twenty seconds. The light-house is built of iron; the foundation cylinder or substructure, which supports the tower, is 25 feet in diameter and 56 feet in height, and shows 15 feet above water. It is filled within 9 feet of its top with concrete and sand. The tower is 29 feet high and 21 feet in diameter at the base, with a projecting circular gallery covered by a roof. A fog bell is struck by machinery a double blow every fifteen seconds when the condition of the weather makes it necessary.

— *Dollers Point and Hog Island Wharf, James River, Virginia.*—The following recommendations made in the Board's annual report for 1890, are renewed:

Lights have been maintained at these points for several years by private enterprise, and their value to the public interests of navigation is now evident. It is therefore recommended that proper measures be taken for establishing range lights at Dollers Point, to guide vessels through the narrow and shallow channel known as Goose Hill Slough, between Hog Island and Jamestown Island; also for the establishment of an inexpensive light on the wharf at Hog Island, to lead the way through another difficult channel from Deep-Water Shoals Light to the north point of Hog Island, where an abrupt turn is made to enter Goose Hill Slough. The estimated cost of these lights is \$2,500, and it is recommended that this amount be appropriated therefor.

— *Cape Charles City, Virginia.*—An appropriation of \$1,000 was made by the act approved March 3, 1891, "for establishing range and harbor lights at and near the entrance of Cape Charles Harbor, Virginia." Plans for the structures were adopted, and permission has been obtained from the owner of the land to occupy the necessary sites.

— *Pages Rock, York River, about 5 miles from Yorktown, Virginia.*—An appropriation of \$25,000 was made by the act approved March 3, 1891, to establish this light-station. Borings to ascertain the character of the shoal were made at the proposed site in June.

405. *Watts Island, Tangier Sound, Virginia.*—In September 288 lineal feet of new picket fence, with two gates, were constructed, and various repairs were made. The accommodations for the keepers and their families are insufficient, and it is proposed to build an additional story to the dwelling, as has been done at other stations in the district having a similar style of house.

408. *Somers Cove, Little Annemessex River, Chesapeake Bay, Maryland.*—In August four of the diagonal girders were repaired, involving the removal and replacing of the main gallery deck, and various repairs were made.

Fifth District.

415. *Lower Cedar Point, Potomac River, Maryland.*—The structures were overhauled and put in good order.

418. *Maryland Point, Potomac River, Maryland.*—After borings had been made in November to ascertain the nature of the foundation it was decided to place at this locality a screw-pile structure, with the bearing surface augmented by disks attached to the piles so as to rest upon the surface of the shoal. This device obviated the necessity of using very long piles, which, besides being expensive, would be difficult to handle. The necessary drawings and specifications were therefore prepared and printed, and advertisement will at once be made for bids to do the work.

425. *Sharkfin Shoal, Maryland.*—This new structure, designed to take the place of the Clay Island light-house, is now in readiness for transportation to the site. It will probably be in position and ready for lighting by September 15, 1891.

— *Point No Point, west side of Chesapeake Bay, between Potomac and Patuxent Rivers, Maryland.*—There is a stretch of about 30 miles between the Cove Point and Smith Point lights which should be better lighted. For a part of the distance navigators are without a guide, where a deviation from their sailing course might carry vessels of heavy draught on to dangerous shoals. There are many of this class of craft now trading to Baltimore, and their number is increasing. A light-house on the shoal off Point No Point would be a useful warning, and a suitable structure can probably be erected there for \$35,000. It is recommended that an appropriation of this amount be made therefor.

— *Cedar Point, mouth of Patuxent River, Chesapeake Bay, Maryland.*—The following recommendation, made in the last three annual reports of the Board, is again renewed:

The harbor at the mouth of Patuxent River is the best on the western side of Chesapeake Bay. Vessels about to enter this harbor from the south pass close to Cedar Point, where the water is deep near the shore. In thick weather sounding is no safeguard, as the change from deep to shoal water is abrupt. The establishment of a light and fog signal on Cedar Point would also be of much value to the general navigation of the bay, as most vessels pass near this point. It is estimated that a proper structure would cost \$25,000.

It is recommended that this amount be appropriated therefor.

429. *Sharps Island, entrance to Choptank River, Maryland.*—It having been found necessary to provide some means of shelter from the spray for the fog-bell machinery, a room, about 5 feet 6 inches by 8 feet in plan, was built on the gallery in November and furnished with a new striking apparatus. The old one was removed for repair.

433. *Greenbury Point Shoal, to replace the light at Greenbury Point, entrance to Severn River, Chesapeake Bay, Maryland.*—This light-house was completed as far as practicable before transfer to the site and it is proposed to commence its erection as soon as the Sharkfin Shoal structure is built.

Fifth District.

— *Swan Point Bar, east side of Chesapeake Bay, opposite Rodkin Point, Maryland.*—The following recommendation made in the Board's annual reports for each of the last three years is renewed:

Swan Point Bar is a very important turning-point for vessels navigating the bay. Steamers reach it by long courses, whether approaching it from the north or south. A light on the extreme point of the bay, in about 12 feet of water, would be of great use to vessels navigating the bay, whether bound for Baltimore or for other points. This location is exposed to the large fields of ice which move in the bay. A structure strong enough to resist them it is estimated will cost \$50,000.

An appropriation of this amount is recommended therefor.

— *Baltimore Light and Fog-Signal Station, Patapsco River, Chesapeake Bay, Maryland.*—The following recommendation made in the Board's last annual report is renewed:

The principal difficulty in the navigation of the Cutoff Channel occurs at its junctions with the Craighill and Brewerton channels. At these places the channel has been widened, and the intention is to still further increase the width. For vessels of small draught there is no difficulty in entering or leaving Baltimore Harbor. It is only in the daytime, when it is difficult to distinguish the buoys which mark the turning-points, and for large steamers, that additional aids to navigation are needed. A light-house is most wanted at the mouth of the Cutoff Channel, i. e., where this channel joins the Craighill. On account of the impressible character of the shoal, and the liability to damage or destruction by fields of moving ice, no light-house, other than an expensive one, can be made permanent. The estimated cost of a suitable structure is \$60,000, and an appropriation of this amount is recommended therefor.

443. *Hawkins Point, Patapsco River, Maryland.*—The amount, \$3,500, awarded by the jury of condemnation for the easement between this and the Leading Point Light was paid to the owner from the current appropriation for repairs, etc., of light-houses. By act of Congress approved March 3, 1891, \$1,000 were appropriated to pay for the services of the United States attorneys who represented the Government in the case. Various repairs were made.

454. *Cape Hatteras, southern extremity of point of the cape, North Carolina.*—The following recommendations, made in the Board's last four annual reports, are renewed:

The third assistant light-keeper at this station is in charge, under the principal keeper of the Cape Hatteras beacon. There is no room for him in the keeper's dwelling. His duties pertain entirely to the beacon, and as it is desirable to have him as near it as practicable, it is deemed necessary to put up a cottage for him in that immediate vicinity. This can be built for \$3,500. A permanent structure, detached from the towers, in which to store oil, is much needed here. A portion of the oil on hand is now stored in a shed which was built for the storage of fuel for the tower, and the rest of it is stored on the floor of the tower, a manifestly improper place for it and dangerous to the tower. An oil house can be built for \$1,500. The Board therefore recommends that an appropriation of \$5,000 be made for the erection of a keepers's dwelling and an oil house at this station.

456. *Outer Diamond Shoals, off Cape Hatteras, North Carolina.*—The contractors for building this important work commenced the under-

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taking. Unsuccessful attempts were made in the spring to ascertain, by boring at the site, the character of the foundation so that the height of the upper cylindrical part of the caisson might be determined and its manufacture completed. By the middle of June sufficient material had been received at Norfolk, Va., the base of operations, to admit of the building of the caisson to the height considered safe and expedient for towing to the site. When the lower cylindrical portion of the caisson was built to a height of 30 feet, and a timber flooring laid, it was launched in the Elizabeth River. By June 17 three more tiers of plates were added and the caisson reached the height of 45 feet. It had a concrete filling 2 feet in depth and it drew 11 feet of water. This height was not increased, but the steel dredging chambers and the inside lining and bracing were completed to a corresponding point and a platform of planks with derricks and dredging apparatus upon it was constructed. On June 28 the caisson was started for its destination in tow of three powerful tugs. When 6 miles below Cape Henry they were obliged to return to Norfolk because of an accident to the machinery of one of the tugs. The damage was promptly repaired and the vessels again started, passing Cape Henry at 8 p. m. on the 29th. At half past 9 on the morning of July 1, 1891, they arrived at the site and anchored the caisson.*

459-468. *Beacon lights in North Landing River, Virginia, and Currituck Sound and North River, North Carolina.*—Steps are now being taken to renew the principal parts of the gas apparatus. A new house for the retorts is required. Various repairs were made.

— *North River Bar, entrance to North River, North Carolina.*—By the act approved on March 3, 1891, an appropriation of \$2,000 was made for establishing lighted beacons to guide through the dredged channels at this bar. These will be placed as soon as practicable.

— *Alligator River, at or near Great Shoal, mouth of Alligator River,*

* The caisson was 54 feet in diameter for a height of 30 feet above the cutting edge. It was then conical for a height of 15 feet, making the total height 45 feet. The tops of the dredging tubes were 5 feet higher and supported the platform that held the dredging and hoisting machinery. The caisson reached the site on the morning of July 1 and was grounded in water from 22 to 25 feet in depth. The scour caused the caisson to sink out of level, and at one time one side was $7\frac{1}{2}$ feet higher than the opposite one. The caisson was nearly restored to a vertical position by dredging. An attempt to stop the scour by using concrete in bags failed, and the caisson soon sank about 10 feet and continued to sink until the morning of July 4, when it was only 5 or 6 feet out of water. The first vessel with material arrived on the afternoon of July 3. Up to July 4 no work had been done on the caisson except that connected with making it vertical. On July 4 the contractors commenced building the caisson, but the sea soon stopped them, when their vessels left the site to obtain a boiler in which salt water could be used, and no further work was attempted after that date. The storm of July 8 carried away the machinery, one dredging tube, and the upper portion of the caisson so that only three dredging tubes remained above the water.

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North Carolina.—The following recommendation which was made in the Board's last annual report is renewed:

There are no lights on the south side of Albemarle Sound, between Croatan and Laurel Point light-houses, a distance of about 30 miles. Alligator River furnishes the only harbor in this distance. The general and local interests of navigation are of sufficient magnitude to justify the erection of a light-house at this locality. It can be built at an estimated cost of \$20,000. Recommendation is made that an appropriation of this amount be made therefor.

475. *Croatan, between Croatan and Albemarle Sounds, North Carolina.*—In June arrangements were made for the introduction of a red sector into this light to mark, in conjunction with another in the Roanoke Marshes light, the Fulker Island obstructions in Croatan Sound. This improvement will take effect July 30, 1891.

— *Pork Point, on the shoal known as the Blockade, off Pork Point on Roanoke Island, Croatan Sound, North Carolina.*—The following paragraph from the Board's reports for the last four years is repeated and the recommendation therein renewed:

There are eleven steamers running regularly, together with a large number of sailing vessels passing this point. Much property has been destroyed and many serious accidents have occurred in the vicinity for the want of a light, and the navigation of these waters is dangerous and much dreaded. The obstructions to the westward of the narrow channel, constructed during the war of the rebellion, have never been removed. This is also a turning-point for vessels navigating the sound, and steamers after leaving Croatan and Roanoke Marshes lights for this point can make it by steering a single course only. The Board, therefore, is of opinion that a light-house and fog signal should be established here, and it is recommended that an appropriation of \$20,000 be made for the purpose.

476. *Roanoke Marshes, Pamlico Sound, North Carolina.*—In June plates of ruby glass were fitted to the lantern so as to form a red sector to mark, with the Croatan light, obstructions in Croatan Sound.*

477. *Long Shoal, Pamlico Sound, North Carolina.*—The buildings of this station were overhauled and put in good order.

479. *Gull Shoal, on the west side of Pamlico Sound, North Carolina.*—Operations at the site were commenced on September 2, 1890. The working platform was placed in position with the necessary material and machinery, and the setting of the foundation piles was begun. Though at first penetration was difficult, it was found that at the depth of 10 feet but little resistance to the revolution of the screw was encountered. This was unexpected, as the preliminary borings made in the vicinity indicated a firm foundation. Upon sounding with a rod the soft layer appeared to extend deeper than the piles had been intended to penetrate. It was therefore evident that without some additional means of support it would not be prudent to place the light-house upon such a foun-

* The change went into effect on July 30, 1891, on which date the red chimneys were replaced by white ones to give effect to the new arrangement. Various repairs were made.

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dation. It was decided to surround each pile with a cast-iron sleeve 1½ inches thick and 11 feet long provided with a disk of the same material 5 feet in diameter, in order to give as large a bearing surface upon the hard upper stratum of the shoal as practicable. This plan had been tested and, while economical, proved entirely effective in a similar case elsewhere in the district. Accordingly, after all the piles had been placed in position and screwed to a depth of 13 feet, the work was suspended until the sleeves could be made. The tender and working party returned to Baltimore to engage in other operations, and the platform and materials were left in charge of watchmen. The sleeves were finished in October, but it was not until December 4 that everything was in readiness to return to the site. Work was re-commenced on December 13. The disks were bolted to the sleeves and the latter, after proper adjustment, were fastened securely to the piles by set screws. The work was then prosecuted rapidly and was practically completed, and on February 1, 1891, the station was ready for the exhibition of the light. The light-house is a wooden dwelling, hexagonal in plan, resting on seven wrought-iron piles 10 inches in diameter, and surmounted by a lantern showing a fixed red light of the fourth order. During thick and foggy weather a bell is struck by machinery a double blow every fifteen seconds.

484. *Pamlico Point, entrance to Pamlico Sound, North Carolina.*—The materials for the erection of this light-house, which had been brought in tow of the tender *Jessamine* with the parts of the Gull Shoal structure, were, on January 13, 1891, taken on scows to their destination, the work at Gull Shoal then being sufficiently advanced to permit the departure of the tender. A platform from which to set the iron work was placed in position. The piles were forced 11 feet into the shoal and secured by socket castings to the horizontal and diagonal braces. The wrought-iron beams for supporting the dwelling were placed; the pieces forming the latter, which had been prepared as far as practicable at the Lazzaretto Depot, were unloaded from the scows and set in place. The lantern was erected and the lens was placed. The roofing of the dwelling and other tin work were put on. The boat davits and hoisting machinery, the fog-bell apparatus, and the iron landing ladder were set. A fuel platform was constructed under the house. This, with some minor details, completed the work of erection, which was accomplished in twenty-three and one-half working days. The painting was left to be finished by three men while awaiting the arrival of the keepers. The structure which replaces the old tower at Pamlico Point is an hexagonal frame dwelling supported by wrought-iron screw piles and upholding a lantern which exhibits a fixed white light of the fourth order. The lens was lighted for the first time on the night of March 9, 1891, and on the same date the temporary stake light which was placed off Pamlico Point in

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1889 was discontinued. A fog bell is provided which is sounded, when required, at intervals of ten seconds.

— *McWilliams Point Shoal, Pamlico River, North Carolina.*—An appropriation of \$100 was made by Congress by the act approved March 3, 1891, for establishing a light on this shoal to guide into the port of Washington, N. C. It will probably be placed in position during the coming winter.

— *Wreck Point, southeast of Cape Lookout, North Carolina.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The establishment of a small light on this point would be of great assistance to a large number of vessels that seek a lee under Cape Lookout. A suitable structure can not be built at this isolated site for less than \$5,000. It is recommended that an appropriation of that amount be made therefor.

— *Beaufort Harbor, North Carolina.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The harbor of Beaufort, N. C., is the only one of importance between Chesapeake Bay and Wilmington, N. C., a distance of some 200 miles. It is the natural outlet to the inland commerce of northern and middle North Carolina, and affords a refuge for vessels overtaken by storms on this exposed coast. A large number of coasting vessels from the North Carolina rivers and sounds pass out to sea by this harbor, thereby avoiding the dangerous navigation outside of Capes Hatteras and Lookout. The annual commerce of this port is about \$1,000,000. The depth of water at low tide is 13 feet 6 inches, and the width of the channel at the bar entrance is 1,000 feet. The inlet width is 7,000 feet, and there is good anchorage inside in 25 feet at low water. The channel across the bar is straight, and if properly marked by range lights it would be the safest and easiest harbor to enter between Cape Henry and Savannah. The estimated cost of establishing the necessary lights is \$10,000. It is recommended that an appropriation of this amount be made therefor.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

379. Cape Henry, Va.	436. Love Point, Md.
384. Lambert Point, Va.	437. Craighill Channel (front), Md.
394. Back River, Va.	438. Craighill Channel (rear), Md.
395. York Spit, Va.	444. Leading Point, Md.
397. Cherrystone, Va.	445. Lazaretto Point, Md.
398. Too's Marshes, Va.	446. Pooles Island, Md.
403. Bowlers Rock, Va.	448. Fishing Battery, Md.
404. Windmill Point, Va.	451. Randall Wharf post-light, Md.
406. Tangier Sound, Va.	452. Currituck Beach, N. C.
409. Great Wicomico River, Va.	454. Cape Hatteras, N. C.
410. Smith Point, Va.	455. Cape Hatteras Beacon, N. C.
411. Point Lookout, Md.	470. Wade Point, N. C.
416. Mathias Point Shoal, Md.	471. Laurel Point, N. C.
422. Solomons Lump, Md.	472, 473. Edenton Harbor Range, N. C.
428. Cove Point, Md.	481. Northwest Point Royal Shoal, N. C.
435. Sandy Point, Md.	483. Brant Island Shoal, N. C.

Fifth District.**LIGHT-SHIPS.**

377. *Cape Charles Light-Vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This vessel was accepted from the contractors on June 10, 1891. She seems to be an admirable vessel, well adapted to the work she has to perform. She was placed on this station on June 25, 1891.

— *Light-ship No. 46.*—This vessel was brought in on June 25, 1891, for general repair.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

377. *Cape Charles Light-Vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This 12-inch steam whistle was in operation 302 hours during the year and consumed 30 tons of coal.

379. *Cape Henry, entrance to Chesapeake Bay, Virginia.*—This first-class steam siren, in duplicate, was in operation 172 hours during the year and consumed 10 tons of coal.

DAY OR UNLIGHTED BEACONS.

They are all in good order, except those at Bodkin Point, Pamlico Point, and Fog Point. These are old towers and are in bad order.

BUOYAGE.

The buoyage of the district is in good order. Most of the buoys were put in order and the beacons were repaired.

DEPOTS.

Lazaretto Point, Baltimore, Md.—The wooden walk of the tramway was repaired in July. In March the small doorways between the rooms on the lower floor of the storehouse were enlarged and fitted with double doors to facilitate the handling of large pieces. This depot is in good condition.

The following recommendation, made in the last annual report, is renewed:

Attention is invited to the necessity of providing a dwelling at this depot for the accommodation of the depot-keeper and his family. Their quarters in the warehouse are unsuitable and uncomfortable, and even were the rooms not required for other purposes it would cost nearly as much to make them comfortably habitable as it would to build a new dwelling. About one-third of the space on the upper floor is reserved for the use of custom-house inspectors, and the large and increasing amount of work on hand in the district demands the use of all storage and shop room available. The depot-keeper must be constantly on the spot, and can not live away from the premises. There is ample room on the Government tract for such a building as is required, and it can be built for \$2,500. An appropriation of this amount is earnestly recommended.

Point Lookout, mouth of the Potomac River, Maryland.—The additional funds required for the rebuilding of the wharf at this depot

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having been provided on September 25, 1890, the work was commenced. Some 121 white-oak piles were driven, 104 of which were sheathed with yellow metal as a protection against the ship worm; 30 new cap logs 12 inches thick and 20 feet long, 51 new string pieces 6 inches by 12 inches by 35 feet, and 700 lineal feet of rail pieces 6 inches thick were put in place, and 9,188 superficial feet of 3-inch yellow-pine decking was laid. As the result of the above there were provided for the depot a new wharf 365 feet long and 15 feet 7 inches wide to a point about 100 feet from the coal shed, whence it broadens gradually to a width of 32 feet in front of the buoy and coal sheds, an extension of the pier-head about 350 square feet, and a new flooring between the two sheds. After the completion of this work, in October, the old wharf was removed and its decking was used to construct, opposite the southwest corner of the coal shed, a V-shaped shore protection of sheet piling about 60 feet long.

Portsmouth, Va.—The accommodations at this depot for the custodian and his family proving inadequate, a wing 16 feet by 18 feet in plan was added to the dwelling, embracing a kitchen, a pantry, and a small room for an office. An appropriation of \$10,000 for the purchase of an additional tract of land adjoining the depot was made by act of Congress approved March 3, 1891. The necessary legal measures are now being taken to deed the property to the Government. Then it will be necessary to extend the present wharf along its water front and dredge a slip on its upper side.

Washington, N. C.—The wharf forming a part of the addition purchased in 1889 is rapidly falling into decay. It should be rebuilt and a coal and buoy shed should be constructed.

TENDERS.

The Holly.—This steamer was actively employed in attending to buoys and in supplying light-stations. She was docked twice, when her bottom was cleaned and painted and necessary repairs were made to her engine and boilers. Her iron hull, boilers, and engines are in fair order, considering how constantly she is employed, but her upper works will not last much longer without repairs. During the year she steamed about 13,000 miles, consuming about 800 tons of coal. She made 224 visits to light-houses, and delivered 101 tons of coal, 48 cords of wood, and miscellaneous supplies. She attended to 382 buoys during the year, and when not employed cruising her crew was kept busy repairing and painting buoys at the buoy depots. The fires were hauled under her boilers forty-two days during the year.

The Violet.—The hull of this steamer was extensively repaired. Her boilers, which give much trouble, must soon be renewed. She steamed 12,294 miles during the past year, consuming 590 tons of coal. She

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made 285 visits to light-houses, delivering 191 tons of coal, 151 cords of wood, and miscellaneous supplies. She worked 410 buoys and repaired 55 beacons.

The Bramble.—This little steamer had her machinery and boilers overhauled during the past year and is now in good order. She is employed towing the gas tank to the Currituck gas beacons.

The Sharpie.—This schooner and the accompanying gas tank are in good condition.

The Jessamine.—This steamer was occupied in transporting material for and assisting in the erection of Gull Shoal and Pamlico Point light-houses; in setting the lens, fog bell, and machinery, boat-hoisting apparatus and davits at Newport News light-station; in making repairs or assisting in the repairs at twenty-three light-stations; in connection with the rebuilding of the wharf at Point Lookout depot and the placing of red sectors in Croatan and Roanoke Marshes lights, and in making examinations, borings, etc., at the sites of Maryland Point, Pages Rock, and the new Cape Charles stations. During two days in November, twenty-five in May, and fifteen in June she was laid up for repairs to her hull, boiler, and machinery, and for painting. She steamed about 8,170 miles, and consumed 632 tons of coal during the year.

The Thistle.—This steamer was of service in the repairs made at Old Point Comfort and ten other light-stations, and in connection with the construction of new light-houses. In July alterations were made to her woodwork to adapt her to the purposes required of a tender, and in October and November repairs were made to her engine and boiler, and her hull was recaulked and covered with yellow metal. During the year she steamed about 6,000 miles with a consumption of 230 tons of coal.

The Nettle.—This steam launch was transferred to the third light-house district on July 22, 1890.

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SIXTH DISTRICT.

The sixth district extends from New River Inlet, North Carolina, to and including Jupiter Inlet, Florida, and includes all the aids to navigation within these limits on the coasts and in the bays, rivers, and harbors of North Carolina, South Carolina, Georgia, and Florida.

Inspector.—Lieut. Commander Roswell D. Hitchcock, U. S. Navy, to September 10, 1890, since then Commander James G. Green, U. S. Navy.

Engineer.—Capt. John C. Mallery, U. S. Army.

In this district there are—

Light-houses and beacon lights, including post-lights	192
Light-ships in position	3
Light-ship for relief	1
Day or uplighted beacons	33
Fog signals operated by clockwork	3
Whistling buoys in position	6
Bell buoys in position	15
Other buoys in position	301
Steamer <i>Wistaria</i> , buoy tender and for inspection and supply	1
Schooner <i>Pharos</i> , for construction and repair	1

LIGHT-HOUSES.

— *Cape Fear, seacoast of North Carolina.*—The following recommendation, which was made in the Board's last two annual reports is renewed:

The shoals forming the continuation of this cape for about 18 miles to the southeast are dreaded by shipmasters only a little less than those at Cape Hatteras. At present a light-ship near the outer extremity of the shoals warns vessels of danger and gives them a good point of departure. This aid to navigation can not be dispensed with; but it is not sufficient to insure adequate protection to the large number of domestic and foreign vessels attracted to this point by the considerable and increasing trade of the neighboring port of Wilmington, N. C., because of the small area lighted by it, and because of its liability to be set adrift from its moorings during heavy storms, which is the very time when its light is most needed. The present Cape Fear light (Bald Head), on account of its inland position and want of height, does not cover the shoal, and therefore does not give sufficient warning to vessels when the light-ship may have drifted from her moorings. A first-order light-house built on the pitch of Cape Fear, with a radius of $18\frac{1}{2}$ miles of light, would be seen so far as to give timely warning, and the fact of being near enough to the coast to see it would be a sufficient indication that the observer should make a better offing. Other reasons for a first-order light-house here may be found in the better protection it would afford to the bight lying north of the cape, which has been left dark since the discontinuance of Federal Point light-station in 1880. The proposed light would more than compensate for the one discontinued at Federal Point. It may be proper to add that there is no first-order light-house between Cape Lookout, North Carolina, and Cape Romain, South Carolina, a distance of about 170 nautical miles. Recent changes in the lighting of the entrance to the Cape Fear River have almost eliminated the Cape Fear light-house (Bald Head) as a harbor light. Its only use

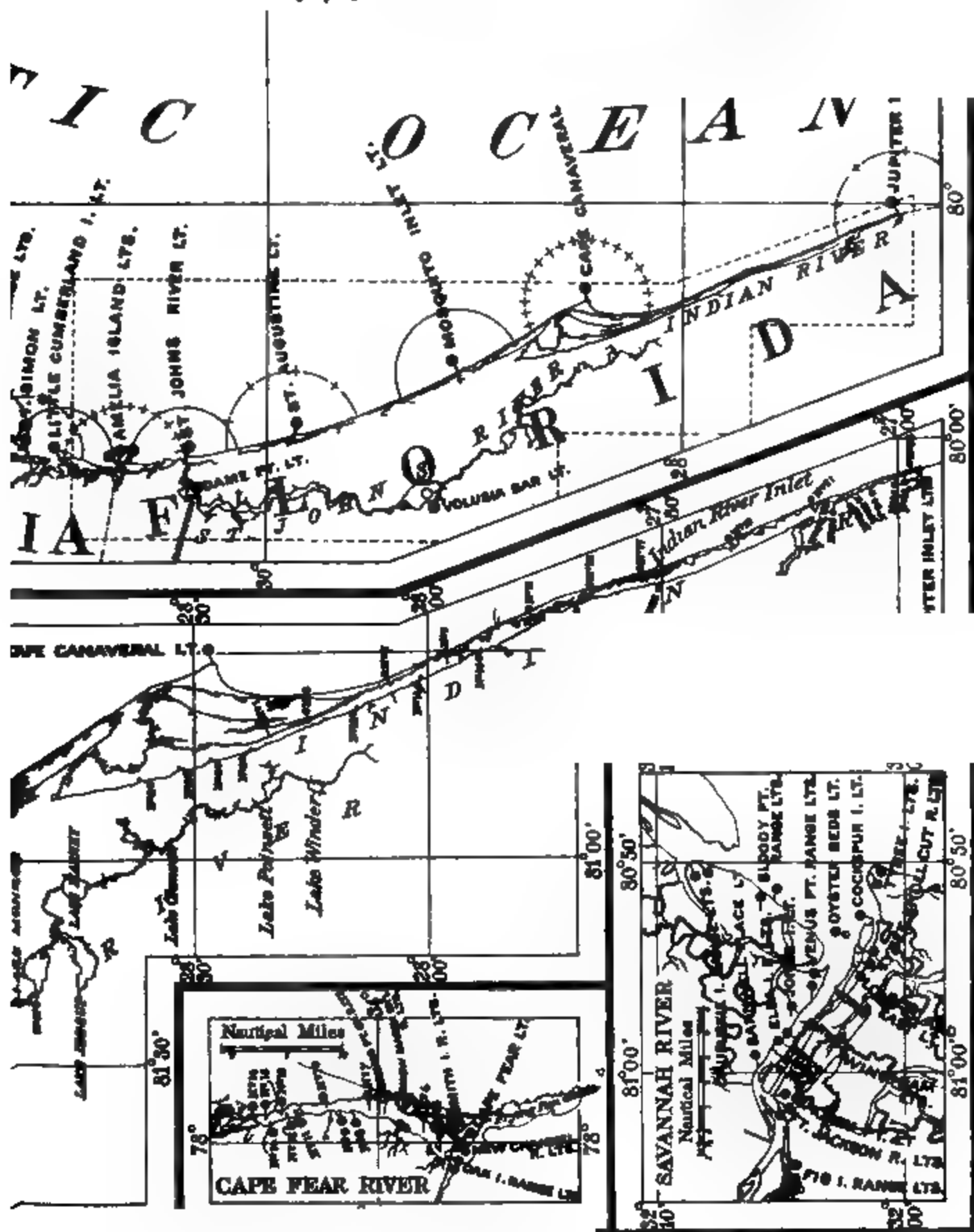


- *Red White*
- *Red Red*
- *Flashing White*
- *Flashing Red*
- *Red White marked by White Mark*
- *Red White marked by Red Mark*
- *Red White marked by Red & White Mark*
- *Flashing Red & White*

- Double Lights
- 1) Lighter building on the bank
- 2) By the bank, operated by means of hot air
- 3) By the bank, operated by machinery

The ranges of buildings are indicated only for some of the principal banks, others may be found in the I.C.C. and other sources.

Corrected to June 30, 1961



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is that of a rear beacon to a stake-light forming a range to guide up the river after crossing the bar. Upon the establishment of the proposed new light on the pitch of Cape Fear the old light might be discontinued, as the tower and the keeper's dwelling are antiquated and discreditable to the Light-House Establishment. It is estimated that a first-order masonry tower 150 feet high, with suitable oil-room, keepers' dwellings, and outbuildings, on the pitch of Cape Fear, will cost \$150,000, and it is recommended that this amount be appropriated therefor.

490-509. *Cape Fear River Post-Lights, North Carolina.*—Post-lights Nos. 496, 497, constituting the Snow Marsh Channel Range, and Nos. 498, 499, constituting the Reeves Point Channel Range, were built to guide through recently dredged channels. They consist of three creosoted piles carrying tubular lanterns and square day marks. All the post-lights of the Cape Fear River, North Carolina are in good condition.

512. *Cape Romain, seacoast of South Carolina.*—In March the lens of this light got so far out of level as to require readjustment. A continuous settlement of the tower on the southwest side is thus indicated, and to facilitate further observations two protected points were fixed at the surface of the ground, in the vertical plane passing through the tip of the pinnacle bolt. One point stands at the base of the tower, and the other 134 feet from it, on a line at right angles to the direction of the greatest inclination. Various repairs were made.

519, 520, 521. *Sullivan's Island Ranges, Charleston Harbor, South Carolina.*—The 46 posts which support the elevated plank walk that connects the dwelling with the rear beacon were resheathed with sheet zinc; some 300 bushels of oyster shells were spread under and around the dwelling, and a brick cover was put over a drain 100 feet long. A fireproof brick oil-house was built, 9 feet by 11 feet in the clear, with ventilators and drain-pipe, and shelves sufficient to receive 450 5-gallon oil-cans.

522. *Fort Sumter, on Fort Sumter, Charleston Harbor, South Carolina.*—Two iron water tanks, each of 250 gallons' capacity, were provided, and various slight repairs were made.

528, 529. *Hilton Head Range, seacoast of South Carolina.*—The channel through which this range is intended to guide vessels, had, at the date of the last annual report, moved so far to the southward as to make the purchase of additional land necessary, that the range might be accommodated to the changed position and direction of the channel. As soon as funds were provided for the purpose by Congress, the land was bought. Its title was approved by the Department of Justice in April, and within ten days the necessary changes were made in the position of the beacon and a heavy growth of intervening timber was cut from an area of 20 acres. The occasion of moving the beacon was taken to put in new sills and to build for it a new tramway.

530, 531. *Paris Island Range, seacoast of South Carolina.*—Two storehouses and the boathouse were resingled, and 300 bushels of oyster

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shells were deposited around the foundation of the latter to stop incipient erosion. While these repairs were being made it was found that the sills and foundation of the front beacon, which is a heavy wooden structure, 50 feet high, supported by a framework set on piles, was dangerously decayed. Temporary supports were put under the beacon, but new sills and foundation will be inserted during the present year.

540, 541. *Tybee Knoll Cut Range, Savannah River, Georgia.*—Repairs to the elevated plank walk, equivalent to the renewal of 1,000 lineal feet, were made. In consequence of changes in the current of the Savannah River, caused by the construction of new jetties, the water near the head of the boat landing has shoaled so much that at low water the keeper's boat grounds are 75 feet from its head. It should be extended 100 feet into the river.

548, 549. *Elba Island Range, Savannah River, Georgia.*—Repairs to the elevated plank walk were made equivalent to the renewal of 250 feet; a wooden revetment 30 feet long was constructed to protect the rear bank near the station from erosion, and a fireproof oil house was built. The action of the jetties, which are being constructed by the War Department for the improvement of the channel of the Savannah River, has resulted in the cutting away of its bank in the vicinity of the station so as to seriously endanger the boathouse and its connection with the site, and even to threaten the safety of the front beacon and dwelling. About 700 feet of the river bank should be protected by a light timber revetment.

550. *Wing Dam, No. 10, Post-Light, Savannah River, Georgia.*—This post-light, which was carried away last year by a schooner which collided with it, was rebuilt.

— *St. Catherine Sound, seacoast of Georgia.*—By an act of Congress approved March 2, 1889, the establishment of a light-station on St. Catherine Island, Georgia, was authorized, but no funds were appropriated for the purpose. The following recommendation for an appropriation of \$20,000 for the establishment of this light, made in the annual reports of the last three years, is therefore renewed:

The distance between Tybee and Sapelo light-stations is 50 miles. The extreme range of these lights so far fails to cover this space as to leave an unlighted gap of 15 miles between them. A light of the fourth order would fill the gap and be of great service to commerce. It should be located near the entrance to St. Catherine Sound, on the south side, as large numbers of vessels trading to Tybee, Sapelo, Doboy, and St. Simon make their landfall near this point. It is estimated that this light can be established at a cost of about \$20,000.

559, 560. *Sapelo Range, entrance to Doboy Sound, Georgia.*—The erosion of the shore line in the vicinity of the site still continues.

— *Doboy Sound, seacoast of Georgia.*—The following recommendation which was made in the Board's last two annual reports is renewed:

The two ranges now established take vessels to the intersection of the Wolf Island and the Sapelo Island ranges, and leave them there without guidance in a very dan-

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gerous position if they anchor; and with The Knuckles on one side and the Chimney Spit Shoals on the other if they proceed. It is therefore recommended that the front beacon of the present Sapelo Island range be removed to a point where it may be used as a rear beacon of a new range, and that a stake light be established to serve as a front beacon for this new range; also, that another range be established higher up the sound, to consist of a steamer lens and lens lantern, respectively, for the rear and front beacons. It is estimated that these new ranges, including sites, will cost \$1,500.

It is recommended that an appropriation of this amount be made therefor.

561, 562. *Wolf Island Range, seacoast of Georgia.*—The platform, 90 feet by 12 feet in plan, attached to the dwelling, which stands in a marsh, was repaired with new sills and deck, and about 500 lineal feet of elevated plank walk was renewed. A fireproof brick oil house, 9 feet by 11 feet in the clear, with ventilators, drainpipe, and shelves sufficient to receive 450 5-gallon oil cans, was built.

563. *St. Simon, entrance to St. Simon Sound, Georgia.*—A fireproof brick oil house, 9 by 11 feet, with ventilators, drainpipes, and shelves, with a capacity of 450 5-gallon oil cans, was built. The following recommendation which was made in the Board's last two annual reports is renewed:

The establishment of a small light is recommended, to form with the St. Simon light as a rear beacon, a range which, while not leading through the best water over the bar would be of service to small vessels seeking a harbor of refuge at night. It is estimated that the range would cost, inclusive of site, \$1,000.

It is recommended that an appropriation of this amount be made therefor.

— *The inland passage from Savannah, Georgia, to Fernandina, Florida.*—In its last two annual reports the Board recommended that it be empowered to erect and maintain twenty-five post-lights, in order to facilitate the navigation of the inland passage from Savannah to Fernandina, at an estimated cost of \$4,000, and that the appropriation for lighting of rivers be increased by that amount to permit of the establishment and maintenance of these lights. This recommendation is renewed.

565, 566. *Amelia Island Range, seacoast of Florida.*—Some 600 lineal feet of sand fence were put up between the dwelling and the beacon to control the movement of the sand dunes which threaten this building. A fireproof oil house, 9 feet by 11 feet in the clear, with ventilators and drainpipes, and shelves sufficient to receive 450 5-gallon oil cans, was built. The movement of the sand dunes still seriously threatens the safety of the dwelling.

567. *Fernandina Harbor Range Lights, Florida.*—Sites were located on Tiger Island, near Fernandina, for two sets of ranges designed to guide vessels into the inner harbor, and plats of the four sites required, with a form of deed by which they should be conveyed to the United States,

Sixth District.

were forwarded to the proper United States attorney in December, 1889, that he might take the necessary measures to acquire title to them. In November, 1890, the United States attorney was requested, in accordance with his recommendation, to obtain title to the sites by proceedings in condemnation; but beyond the preparation of a petition for condemnation for file in the proper courts, no progress has been reported.*

— *Mount Cornelia, mouth of the St. Johns River, Florida.*—The following recommendation which was in the Board's last two annual reports is renewed:

The present light-house at the mouth of St. Johns River, Florida, is of the third order, and for years there have been complaints that it was inefficient as a seacoast light, while as a harbor light the new jetty channel will soon require the establishment of a range to which this structure, on account of location, can not be adapted. It has a small base and stands on marshy ground, and can not be increased sufficiently in height to make it a good seacoast light. A site peculiarly adapted to the erection of a light-house is found near the mouth of the river, on its north side, on Mount Cornelia, which has an extreme elevation of 62 feet above mean sea level, and on which a good foundation with sufficient area for a modern light-station could be had at an elevation of 50 feet above mean sea level. A first-order light-house, with focal plane 150 feet above its base, erected at this point would have a focal plane 200 feet above mean sea level and a 20-mile radius of light. This would intersect with the adjacent seacoast light to the southward, situated at St. Augustine, Fla., better than the present St. Johns River light does, and would practically cover the area now lighted by the adjacent seacoast light to the northward, situated on Amelia Island, Florida, as its area of light would intersect with that of the next most northerly light at Little Cumberland Island, Georgia, and almost touch that of St. Simon, Georgia. The proposed light might thus be made to take the place of two or even three third-order light-houses, all old and unsightly structures, and provide a light second only on the Atlantic coast to that at the Highlands of Navasink, N. J. It is estimated that a first-order masonry tower 150 feet high, with suitable oil room, keepers' dwellings, and outbuildings, will cost on Mount Cornelia \$175,000.

It is recommended that an appropriation of that amount be made therefor.

578. *Dame Point, St. Johns River, Florida.*—This structure, which stands on a foundation of iron piles, having been struck slightly several times by lightning, an additional lightning conductor of copper was provided to run from the lantern sill to one of the iron piles and thence below the lowest water line.

652. *St. Augustine, seacoast of Florida.*—Some 1,400 barrels of broken coquina shell were distributed over the site within the brick inclosing wall, to prevent sand drift.

654. *Cape Canaveral, seacoast of Florida.*—This location is endangered

* On August 14, 1891, the Board was informed by the Department of Justice that all the papers and data in this case were lately destroyed by fire. Measures were at once taken to duplicate the papers. When this is done the proceedings in condemnation will go on.

Sixth District.

by the encroachments of the sea. By the act approved August 30, 1890, Congress appropriated \$80,000 for moving this station to a safe site, should the continued encroachment of the sea make such action necessary. Before the appropriation was made, however, wooden works of protection were constructed having a frontage of 800 feet along the high-water line of the Atlantic beach. At the date of the last annual report this work had resulted in pushing back the high-water line from the revetment at its north angle, 205 feet; at its middle, opposite the tower, 150 feet; at the south angle, 173 feet. On November 30, these distances were, respectively, 206 feet, 150 feet, and 187 feet, but on April 30, 1891, after long-continued, heavy, easterly winds, these were reduced to 134 feet, 106 feet, and 176 feet. During May and June the site began to make out again, and on June 30 the distances were 160 feet, 136 feet, and 176 feet. The present protective works have apparently attained their greatest limit of usefulness, but it is probable that a new line of revetment, constructed along the present high-water line, would build out the front an additional 100 or 200 feet. In December, 1890, a survey was made to determine the best location for a new site, and for a wharf, tramway lines, and other structures which would be required for use during the removal of the station. At its session of March 2, 1891, the Light-House Board considered the subject, and decided that the new location of the tower should be fixed at a point about one mile nearly due west from its present position, but that no steps for its removal should be taken until further report of the engineer of the sixth light-house district should show it to be necessary or desirable.

570-577, 579-641, 643-651. *Post-Lights on the St. Johns River, Florida.*—These 79 lights are generally well kept, and are of indispensable service for night navigation of the river. During the year, with the assistance of the tender and the floating pile-driver, all the lights were put in thorough condition, and repairs were made wherever necessary. Eight new post-lights were built, 1 day mark was changed to a post-light, and 2 post-lights were discontinued. The North end of Lake George post-light No. 108 was raised 10 feet to give the desired visibility across the lake.

655-680. *Post-Lights on the Indian River, Florida.*—The service of these 26 lights was excellent, although there are 154 miles of river covered by these 26 lights, although but few people live on this river to whom the pay for the care of them is sufficient inducement to take charge of them. The parties who are engaged in the navigation of this river have shown repeatedly their desire to make the service of the lights as effective as possible. It was found that seven additional beacons were needed on the lower part of the river. They are now in process of construction. They will materially add to the usefulness of the present ones.

SIXTH DISTRICT.

The sixth district extends from New River Inlet, North Carolina, to and including Jupiter Inlet, Florida, and includes all the aids to navigation within these limits on the coasts and in the bays, rivers, and harbors of North Carolina, South Carolina, Georgia, and Florida.

Inspector.—Lieut. Commander Roswell D. Hitchcock, U. S. Navy, to September 10, 1890, since then Commander James G. Green, U. S. Navy.

Engineer.—Capt. John C. Mallery, U. S. Army.

In this district there are—

Light-houses and beacon lights, including post-lights	192
Light-ships in position.....	3
Light-ship for relief	1
Day or unlighted beacons.....	33
Fog signals operated by clockwork	3
Whistling buoys in position.....	6
Bell buoys in position.....	15
Other buoys in position	301
Steamer <i>Wistaria</i> , buoy tender and for inspection and supply	1
Schooner <i>Pharos</i> , for construction and repair	1

LIGHT-HOUSES.

— *Cape Fear, seacoast of North Carolina*.—The following recommendation, which was made in the Board's last two annual reports is renewed:

The shoals forming the continuation of this cape for about 18 miles to the southeast are dreaded by shipmasters only a little less than those at Cape Hatteras. At present a light-ship near the outer extremity of the shoals warns vessels of danger and gives them a good point of departure. This aid to navigation can not be dispensed with; but it is not sufficient to insure adequate protection to the large number of domestic and foreign vessels attracted to this point by the considerable and increasing trade of the neighboring port of Wilmington, N. C., because of the small area lighted by it, and because of its liability to be set adrift from its moorings during heavy storms, which is the very time when its light is most needed. The present Cape Fear light (Bald Head), on account of its inland position and want of height, does not cover the shoal, and therefore does not give sufficient warning to vessels when the light-ship may have drifted from her moorings. A first-order light-house built on the pitch of Cape Fear, with a radius of 18½ miles of light, would be seen so far as to give timely warning, and the fact of being near enough to the coast to see it would be a sufficient indication that the observer should make a better offing. Other reasons for a first-order light-house here may be found in the better protection it would afford to the bight lying north of the cape, which has been left dark since the discontinuance of Federal Point light-station in 1880. The proposed light would more than compensate for the one discontinued at Federal Point. It may be proper to add that there is no first-order light-house between Cape Lookout, North Carolina, and Cape Romain, South Carolina, a distance of about 170 nautical miles. Recent changes in the lighting of the entrance to the Cape Fear River have almost eliminated the Cape Fear light-house (Bald Head) as a harbor light. Its only use



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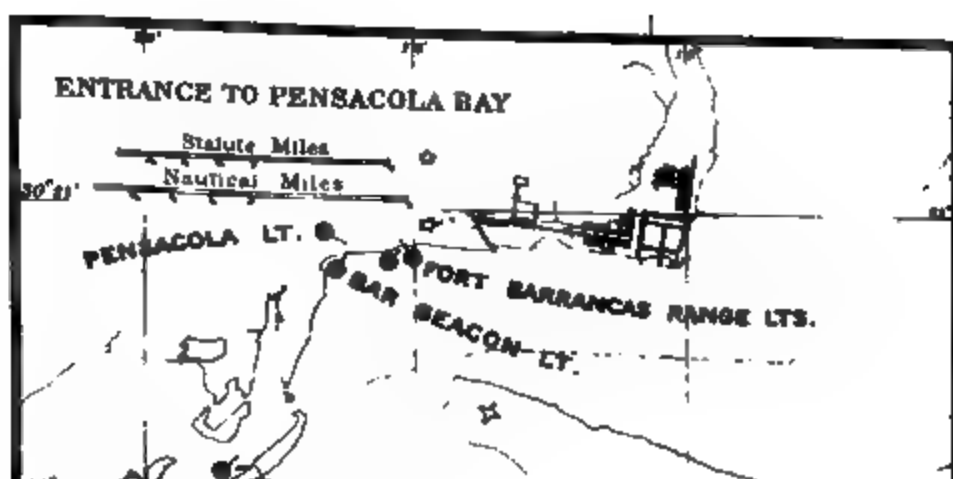
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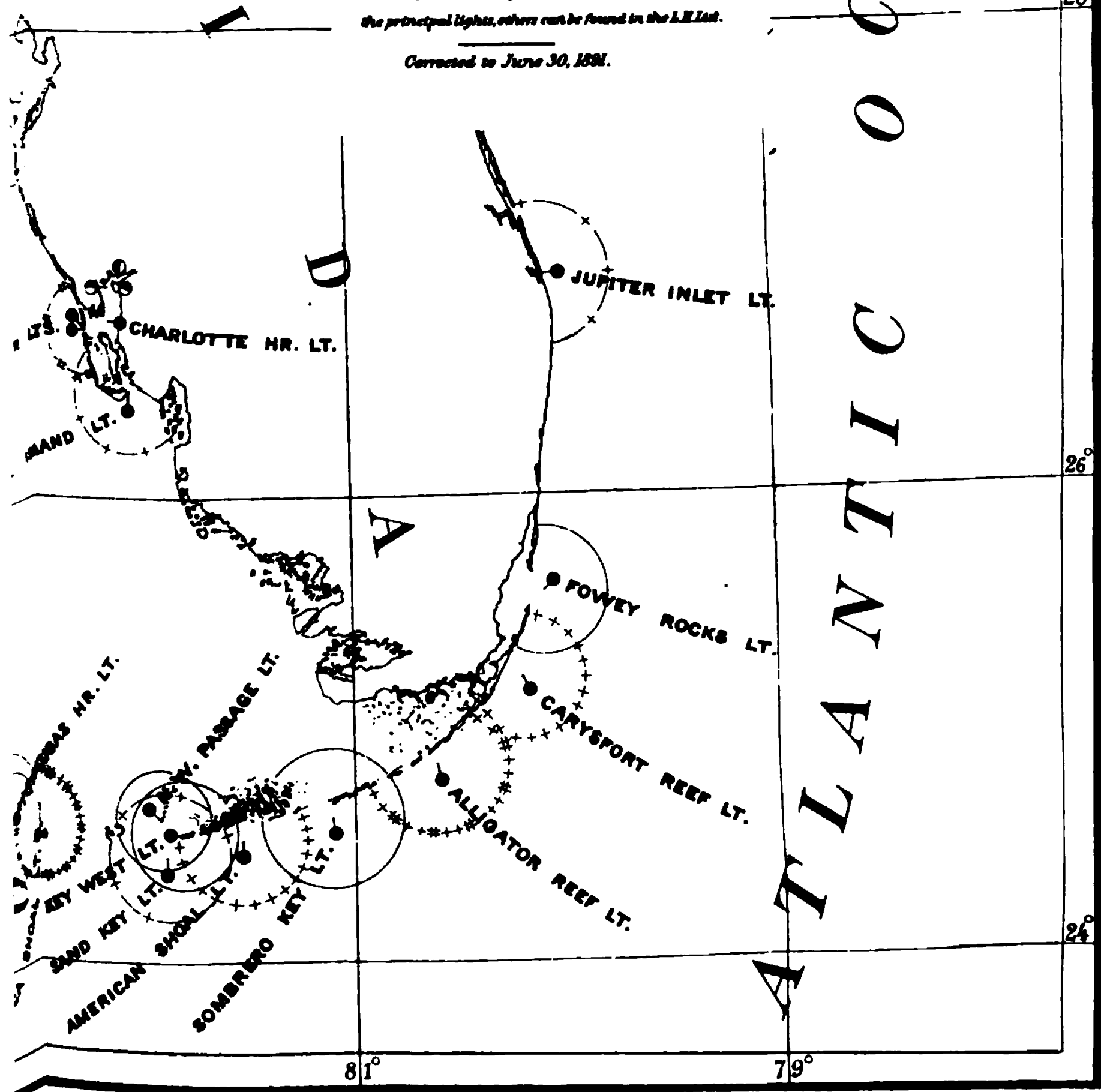
The different varieties of Lights and Fog Signals are designated by the following Characters.

- Red White
- ... Red Red
- ... Flashing White
- ... Flashing Red
- . Red White varied by White Flasher
- . Red White varied by Red Flasher
- . Red White varied by Red & White Flasher
- ... Flashing Red & White
- Double Lights

- ⚡ Lights building or to be built
- ⚡ Fog Signals operated by steam or hot air
- ⚡ Fog Bells struck by machinery

The Ranges of Visibility are indicated only for some of the principal lights, others can be found in the L.H. List.

Corrected to June 30, 1891.



Seventh District.

687. *Sand Key, Gulf of Mexico, Florida.*—In following out its plan to indicate dangerous water on Florida reefs in the vicinity of light-houses by covering it with red rays, the Board directed that red sectors be placed in the Sand Key illuminating apparatus, and it is expected that it will be accomplished early this fall.*

688. *Key West, Gulf of Mexico, Florida.*—The burners were repaired. A new storeroom and kitchen with hip roof were built adjoining the main house. A brick oil house was built, 6 by 8 feet between the walls, ceiling 8 feet high, and the walls 8 inches thick. It has a cement floor and galvanized gutters. New ventilators were placed in the tower. The tower is of brick and in good condition. It is, however, not high enough to make it as conspicuous as it should be. Tall trees obstruct the view of the light from the northwest. It is an important light of the third order, and is a leading light for no less than seven different channels in the vicinity. The tower is but 60 feet high. It would be an immense improvement in many ways to build up the tower about 20 feet, to increase the height of the watchroom section about 3 feet, and to provide a suitable balcony.

The watchroom is so low that the keeper can not stand erect in it, and the balcony is too narrow for practical purposes. The changes suggested would require the substitution of a temporary light for about a month, the construction of a new watchroom section with suitable balcony, a new pedestal for the lamp, and an increase in the height of the brickwork of the tower of about 20 feet. It is estimated that the proposed work will cost, including scaffolding and labor, about \$4,500, and recommendation is made that an appropriation of this amount be obtained therefor.

five seconds. *The easterly red sector* will lie between S. W. $\frac{1}{4}$ S. and S. W. by W. $\frac{1}{4}$ W., about 18° of arc, and will extend from about 1 mile south of beacon E on Conch Reef to the northward of Black Buoy No. 9. *The westerly red sector* will lie between N. E. by E. $\frac{1}{4}$ E. and N. E. $\frac{1}{4}$ E. about 17° of arc, and will extend from about three-fourths of a mile south of Beacon 7 on Tennessee Reef to one-fourth of a mile south of red buoy No. 12.

* On September 30, 1891, change was made in the characteristics of this light, so that they now are as follows:

Sand Key.—Fixed white for one minute, varied in the next minute by a white flash of ten seconds' duration, preceded and followed by partial eclipses of twenty-five seconds, from W. $\frac{1}{4}$ S. through southward to E. N. E. $\frac{1}{4}$ E., and from E. $\frac{1}{4}$ N. through northward to S. W. $\frac{1}{4}$ W.; fixed red for one minute, varied in the next minute by a red flash of ten seconds' duration, preceded and followed by partial eclipses of twenty-five seconds throughout the remaining sectors. *The easterly red sector* will lie between S. W. $\frac{1}{4}$ W. and W. $\frac{1}{4}$ S. about $33\frac{1}{2}^{\circ}$ of arc, and will cover the space between the outer edge of reef and Red Buoy No. 2 in Main Ship-Channel. The light will appear red after passing the Outer Main Channel buoy until just before the three buoys at the turn in this channel are reached. The southern edge of this sector will lie about $1\frac{1}{2}$ miles south of Beacon A on Eastern Sambo. *The westerly red sector* will lie between E. $\frac{1}{4}$ N. and E. N. E. $\frac{1}{4}$ E., about $14\frac{1}{2}^{\circ}$ of arc, and will cover beacon 2 on the Western Dry Rocks.

Seventh District.

694. *Gasparilla Island, near the southern end of Gasparilla Island, and northern side of the Boca Grande entrance to Charlotte Harbor, Gulf of Mexico, Florida.*—This is a new light, the erection of which was completed in September last. It is a one-story, white, frame dwelling, with green blinds and a shingled roof, surmounted by a black lantern displaying a fixed white light of $3\frac{1}{2}$ order, varied by a red flash every twenty seconds, the focal plane of which is 44 feet above mean low water. The structure is on a brown pile foundation. A similar structure, without the lantern, stands about 70 feet distant. It is a dwelling for the assistant keeper. This light was first displayed December 31, 1890.

695. *Gasparilla Island Beacon, about 735 feet S. W. by W. from Gasparilla Island Light, Gulf of Mexico, Florida.*—This beacon was erected in September last and is in range with Gasparilla Island light-house, and is a square, pyramidal structure, surmounted by a black lantern 20 feet above mean sea level. A boat 18 feet long was furnished.

696. *Charlotte Harbor, in about 10 feet of water, $2\frac{1}{2}$ miles S. E. by E. $\frac{1}{2}$ E. from Cape Haze, near the middle of the harbor, Gulf of Mexico, Florida.*—This new station, which was erected in September last, is a square white one-and-a-half story structure, with green blinds and brown roof, surmounted by a black lantern displaying a fixed red light of the fifth order, 37 feet above mean sea level, and illuminates the entire horizon. A boat 16 feet long was furnished.

697. *Mangrove Point Beacon, in about 15 feet of water, $1\frac{3}{4}$ miles S. E. by S. from Mangrove Point, the point of division between Myacca River and Pease Creek, Florida.*—This beacon was erected in September 1890, but has not yet been lighted. It is a square, black pyramidal skeleton structure.

698. *Red Beacon, in about 13 feet of water, south side of Pease Creek channel, Florida, at the last turn.*—This beacon was erected in September, 1890, but has not yet been lighted. It is a square, red, pyramidal skeleton structure.

699. *Live Oak Point Beacon, in about 10 feet of water, north side of the channel, $\frac{7}{8}$ of a mile S. W. by S. from Live Oak Point and 1,500 feet N. by E. $\frac{1}{2}$ E. from the extremity of the railroad wharf making out from south shore of Pease Creek, Florida.*—This beacon was erected in September, 1890, but has not yet been lighted. It is a square, black, pyramidal skeleton structure.

702. *Cedar Keys, harbor of Cedar Keys, Gulf of Mexico, Florida.*—The main dwelling was thoroughly overhauled and put in good order. A new passageway was built, with a shingled roof, from the kitchen to the main house, 4 feet by 24 feet, and various repairs were made. The fence around the station, 400 feet long, was rebuilt, with pointed pickets and three new gates, and 150 feet of plank walks were rebuilt. A new brick oil house was put up with 8-inch walls, slate roof and a concrete

Seventh District.

floor. It is 10 feet long by 6 feet wide, with a ventilator in the roof and shelving on the inside. All new work was painted or white-washed.

704. *Crooked River, Gulf of Mexico, Florida.*—On July 31, 1888, \$40,000 were appropriated for the erection of a light-house on the mainland to the westward of Crooked River, in Franklin County, Fla. The land for the site was selected and a deed of 12.02 acres, with a tracing showing the location, was sent to the United States attorney for that district, on September 19, 1889, to obtain and verify the abstract of title for the same. The deed was found insufficient and condemnation proceedings were instituted.*

706. *Apalachicola Bay Range (front), on the eastern edge of the northern end of the dredged channel into Apalachicola Bay, Florida.*—This lighted beacon was totally demolished August 21, 1890, by a barge towed by the tug *Constance*. It was rebuilt and is now in good condition.

— *St. Joseph Point, St. Joseph Bay, Gulf coast of Florida.*—The following recommendation, which was made in the Board's annual reports for the last three years, is renewed:

The fishing fleet on this coast is large. A southerly gale is calculated to drive these vessels upon a lee shore. The only harbor of refuge for some 60 miles is St. Joseph Bay. This is easily accessible in the daytime, but at night it is difficult of entrance without a light. The Board is decidedly of opinion that it would be largely to the interests of the fishing fleet in particular, and the commerce and navigation of the Florida coast in general, that this light should be established. It is estimated that it can be done for \$25,000. A bill for this purpose was favorably reported upon recently by the Senate Committee on Commerce, and the Senate inserted the item in the sundry civil appropriation bill, but as it failed of enactment the recommendation is renewed.

— *Tampa Bay, Florida.*—It having been found that the bay afforded the best harbor on the Gulf coast, that a railway terminated at its head, that it was visited regularly by several lines of steamers and many sailing vessels, and that it was made a port of call for our naval squadrons, the Board decided to establish such additional aids to navigation as were necessary and were within its power. The following-named changes in the buoyage and beaconage of this bay were therefore made:

A second-class whistling buoy, black and white perpendicular stripes, has been placed, in 27 feet at low water, three-fourths of a nautical mile outside of the Bar Buoy.

A three-pile wooden beacon, black No. 5, has been erected on the south end of the Middle Ground, in 16 feet at low water.

* On August 14, 1891, the Board was informed by the Department that all the papers and data in the case were lately destroyed by fire. Measures were taken at once to duplicate the papers. When this is done, the proceedings in condemnation will go on.

Seventh District.

The Middle Ground Buoy, black No. 5, has been changed to a third-class can, and is now No. 7.

The South End Gadsden Point Bank Buoy, black No. 7, has been changed to No. 9.

The Gadsden Point Bank Buoy, black No. 9, has been changed to a second-class can, and is now No. 11.

The Long Shoal Buoy, black No. 11, previously reported as sunk, has been replaced and is now No. 13.

A third-class can buoy, black No. 1, has been placed, in 18 feet at low water, to mark the west side of the channel between North Entrance Buoy and Turn Buoy.

A third-class nun buoy, red No. 2, has been placed, in 18 feet at low water, to mark the east side of the channel between North Entrance Buoy and Turn Buoy.

A three-pile wooden beacon, red No. 6, has been erected, in 19 feet at low water, close to the channel, on the east side of the entrance to South Cut.

The Junction Point Shoal Beacon, red No. 6, has been removed.

A two-pile wooden beacon, red No. 8, has been erected, in 19 feet at low water, close to the channel, on the east side of the northern end of South Cut.

The Red Pile Buoy, No. 8, has been removed.

A two-pile wooden beacon, red No. 10, has been erected, in 19 feet at low water, on the east side of the south entrance to North Cut.

A two-pile wooden beacon, red No. 12, has been erected, in 19 feet at low water, on the east side of the northern end of North Cut.

Most of the merchant and all of the naval steamers frequenting these waters carry electric search lights, and with them it is quite easy to pick up these beacons and buoys in the darkest nights.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

682. Fowey Rocks, Fla.
683. Carysfort Reef, Fla.
684. Alligator Reef, Fla.
685. Sombrero Key, Fla.

687. Sand Key, Fla.
689. Northwest Passage, Fla.
691. Dry Tortugas, Fla.

DAY OR UNLIGHTED BEACONS.

No changes were made in the day beacons during the year, except in those mentioned under the head of Tampa Bay.

BUOYAGE.

All buoys were changed during the year, except a few of lesser importance in the western part of the district, which could not be reached

Seventh District.

by the light-house tender *Putnam*. Two bell buoys of the four-cylinder variety, after one year's use in not very exposed positions, were found to be practically inoperative. On each buoy one of the cast-iron cylinders containing the steel balls worked loose, apparently by its own weight, which deadened the sound made by the other balls. One of these buoys had a list when put into the water which could not be corrected, and the other did not float perfectly upright. Eight small buoys and appendages were lost. Five lost buoys were recovered without cost.

. Buoys placed during the year.

One wreck buoy in the southeast part of Pensacola Bay.

One wreck buoy to mark steamer *Cool*, in Tampa Bay.

Three buoys to define the channel and mark the anchorage in the fine harbor of Bahia Honda, Hawk Channel.

Two buoys to mark Half-Moon Shoal and New Ground Rocks, western end of Marquesas Quicksands.

One buoy on a newly made shoal in Boca Grande entrance to Charlotte Harbor.

One buoy for accommodation of the fishing fleet at entrance to Sarasota Pass from Tampa Bay.

Buoys discontinued, no longer necessary.

Junction buoy, Punta Gorda Shoal buoy, and Live Oak Point buoy, Charlotte Harbor, by reason of the establishment of beacons to mark their respective localities.

Sand Spit buoy, Pensacola Bay.

The sea birds of the gulf used the buoys and beacons as roosting places to such an extent as to change their color. It was found necessary therefore to surmount the most important of the red and black buoys and beacons with strips of wood, through which copper nails were so driven as to present their sharp points uppermost, and thus to make them untenable as perches. This expedient has thus far proved successful in preserving the color of the buoys.

DEPOTS.

Tortugas (Fort Jefferson), Florida.—All the piles standing in the water, although creosoted, are more or less worm-eaten. Some of the planking is rotten. It is estimated, after careful examination, that at least \$2,000 will be required to place this wharf and shed in good condition.

Egmont Key, Florida.—The wharf needs much repair, as many of the supporting piles are eaten off by the teredo. All the fender piles are broken and much of the planking is decayed. The cistern is in poor condition and should be replaced, as should the pipes laid to the end of

Seventh District.

the wharf from it, so that the light-house tenders can take water from the cistern. New rain-water leaders on the structures are also needed.

Key West buoy depot and coal shed, Florida.—The coal shed has settled about 5 feet at one end and a number of piles are broken or badly worm-eaten. Such of the supporting piles as are still sound may be driven till they rest upon the rock and a follower of proper length fastened to their heads with an iron sleeve. The defective piles should be replaced with the new, creosoted piles. Several of the piles under the wharf require renewal and also some of the stringers and planking. Some of the fender piles must be replaced. A new cistern is needed and it should have pipe connections leading to the end of the wharf, so that the light-house tenders can take water from it. New rain-water leaders are needed on the structures. The railway track should be replaced and new cars for carrying coal and buoys supplied. The shed should be repaired and put in good order. The wharf was restored to the Light-House Establishment and a laborer is to be placed in charge from July 1, 1891.

Pensacola, Florida.—In good condition.

TENDERS.

The Laurel.—This steamer was constantly employed at the regular supply, inspection, and buoy work until April 10, 1891, when she was relieved by the steam-tender *Putnam* and sent north for repair. She cleaned 255 buoys and painted them three coats each, changed 240 buoys, landed 24 cords of fuel and 67 rations at stations, made 67 inspection trips and her crew worked seventy days at the different depots. The engineers bushed 60, and repaired 25 buoys while away from the blacksmith shop at Pensacola. She was under steam two hundred and twenty-eight days and fires were hauled fifty-four days. In doing this work she steamed 8,033 nautical miles and consumed 494 tons of coal. On February 23, while steaming up Hawk Channel, the starboard propeller dropped off in deep water, owing to the breaking of the shaft, but it was subsequently recovered by sweeping.

The Putnam.—This steamer was actively employed from the time of her arrival in the district in place of the *Laurel*. She cleaned 85 buoys and painted them three coats each, changed 78 buoys, landed 4 cords of fuel at stations, made 19 inspection trips, and her crew worked twenty-two days at depots. The engineers bushed 19 buoys while away from the blacksmith shop. She was under steam seventy days and fires were hauled thirteen days. In doing this work she steamed 1,880 nautical miles and consumed 114 tons of coal. Although the tenders ran 275 nautical miles more than last year, they consumed 85 tons of coal less.

The Arbutus.—This steamer was actively employed during the year in making repairs to the light-houses in the seventh and eighth dis-

Seventh District.

tricts. She was docked and the old metal was taken off and replaced with new where required. Calking was done where needed, and other minor repairs were made. A starboard crank-pin shaft was put in, the machinery was thoroughly repaired, and a new pair of composition propeller wheels was put on. During the year she ran 15,168 miles and consumed 639 tons of coal. The tender is in excellent condition.

The Clover.—This schooner was actively engaged in making repairs to the various light-stations in the seventh and eighth districts until the completion of repairs at Key West light-station during April, 1891, when she sailed for West End, La., in Lake Pontchartrain, where the crew was discharged and the tender was left in charge of two watchmen. She will probably be put in commission again in August, 1891. A few slight repairs were made and a steam windlass was furnished for use in hoisting the anchor. The tender is in good condition.

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EIGHTH DISTRICT.

The eighth district extends from the mouth of the Perdido River, the boundary between Florida and Alabama, to the Rio Grande, the southwestern boundary of Texas, and includes all aids to navigation on the Gulf coast of the United States within these limits, together with those in Lakes Borgne, Pontchartrain, Maurepas, Grand Lake, and Lake Chicot, and those on the Mississippi River below New Orleans, La.

Inspector.—Lieut. Commander George B. Livingston, U. S. Navy, until his death, September 19, 1890; since then Commander Charles J. Barclay, U. S. Navy, until January 1, 1891, who was succeeded by Commander Dennis W. Mullan, U. S. Navy.

Engineer.—Capt. Walter L. Fisk, Corps of Engineers, U. S. Army, until February 9, 1891; since then Maj. James B. Quinn, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights (including twelve post-lights on the Mississippi River, Grand Lake, and Lake Chicot)	62
Light-ships in position	2
Day or unlighted beacons	17
Fog signal operated by steam	1
Fog signals operated by clockwork	11
Whistling buoys in position	2
Other buoys in position	84
Steamer <i>Passy</i> , buoy tender and for supply and inspection	1
Steamer <i>Arbutus</i> , for construction and repair in the seventh and eighth districts ..	1
Schooner <i>Clover</i> , for construction and repair in the seventh and eighth districts ..	1

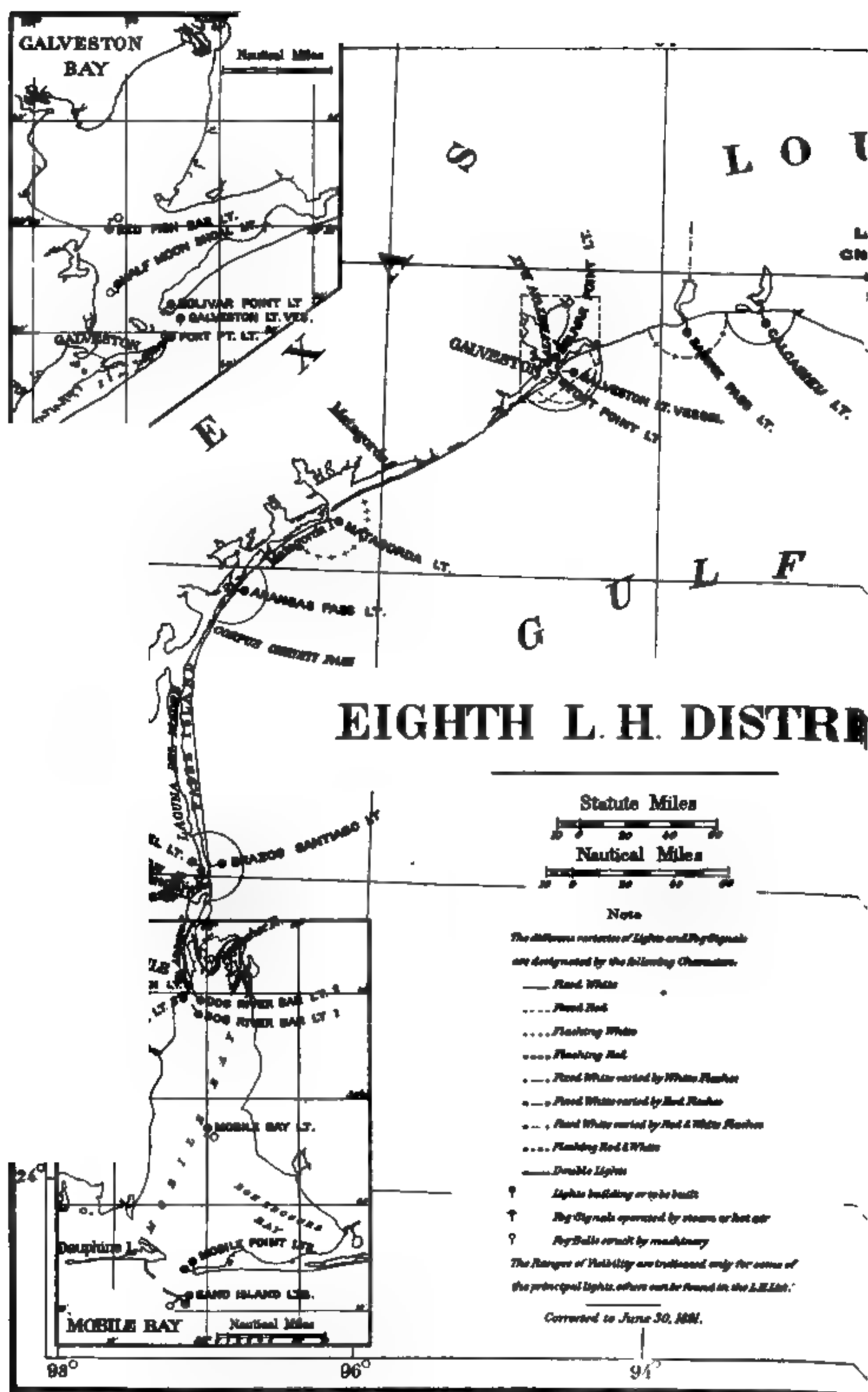
LIGHT-HOUSES.

— *Dog River Bar, Mobile Bay, Alabama.*—The following recommendation, which was made in the Board's annual reports for the last three years, is renewed:

The present system of lights is not sufficient to enable vessels to run up to Mobile at night. The Board therefore renews its recommendation of last year, that a screw-pile structure be established carrying a fourth-order flashing light at about where the upper channel beacon now stands, near the second bend in the dredged channel. For this purpose an appropriation of \$20,000 should be made.

— *The Ship Channel, Mobile Bay, Alabama.*—The following recommendation, which was made in the Board's annual report for last year, is renewed:

The interests of commerce require that additional aids to navigation be established along this channel. The Board is of opinion that five or more light-stations should be built along the ship channel. It is estimated that these lights can be established for \$60,000, and it is recommended that an appropriation of this amount be made therefor.



Eighth District.

724. *Dog River Bar and Choctaw Pass Channel (front for both), Beacon No. 2, at the intersection of the axis of Dog River Bar and Choctaw Pass Channels, Alabama.*—This beacon was damaged to such an extent in June, 1890, by lightning, that it had to be entirely rebuilt. It is now in good condition.

728. *Round Island, off Pascagoula, Mississippi.*—An oil house was erected and minor repairs were made.

731. *East Pascagoula River, Mississippi.*—Thirty-six tons of rock ballast were placed in front of the station.

744. *Pass Manchac, between Lakes Maurepas and Pontchartrain, Louisiana.*—The buildings were overhauled and put in thorough repair. A new picket fence, 250 feet long, with a gate, and four rows of barbed wire on the bottom, was built around the dwelling. The breakwater was rebuilt and various repairs were made.

745. *Amite River, Lake Maurepas, Louisiana.*—The structure was raised and repaired, and the foundation was in effect renewed.

746. *Chandeleur, Chandeleur Island, Louisiana.*—A new dwelling for the assistant keeper, and a walk on creosoted piles, were erected by contract, and 600 barrels of oyster shells were placed at the base of the tower for its protection.

748. *South Pass East Jetty, mouth of the Pass, Louisiana.*—This structure consists of a square, white pyramidal wooden tower, with green blinds, surmounted by a lantern and a flagstaff, with a gilt ball 29 feet above the lantern. A fog-signal house, painted like the tower, stands alongside, and both buildings are elevated above the water on a platform supported on brown piles. The focal plane is 54 feet above mean sea level and the light illuminates the entire horizon. During thick or foggy weather a bell will be struck by machinery a single blow every 10 seconds.

751. *South Pass, 2 miles from the end of the jetties, Louisiana.*—At this station the breakwater was extended 200 feet, a plank walk was erected from the breakwater to the keeper's dwelling, and various repairs were made.

752. *Southwest Pass, Louisiana.*—A new store and oil house, 16 feet by 28 feet in plan, was built and various repairs were made.

754. *Head of the Passes beacon, entrance to South Pass, Louisiana.*—This beacon was rebuilt and consists of a brown, square, pyramidal, skeleton iron tower, surmounted by a black lantern. The focal plane is 48 feet above mean sea level.

757. *Cubits Gap Fog-Signal Station, at Cubits Gap, Louisiana, about 2,000 feet above Cubits Gap Post-Light.*—This bell tower was erected in March, 1891. It is a square wooden tower built on four creosoted piles and is 26 feet high. The tower is painted white, the roof brown; it is located at the lower point of Cubits Gap. The nearest house to the tower is at a distance of about 600 feet, and the pilot's station is about a half mile distant.

Eighth District.

763. *Barataria Bay, on Grande Terre Island, at the entrance to Barataria Bay, Louisiana.*—The structures were thoroughly overhauled and put in good order.

766. *Southwest Reef, at the entrance to Atchafalaya Bay, Louisiana.*—The structures were thoroughly overhauled and put in good order.

774. *Calcasieu, entrance to Calcasieu River, Louisiana.*—A new kitchen, 15 feet by 30 feet in plan, was built, and connected with the gallery of the light-house by a wooden platform. The walk from the dwelling to the bank of the river was rebuilt, and minor repairs were made.

784. *Point Isabel, entrance to Brazos Santiago, Gulf of Mexico, Texas.*—By the act approved March 2, 1889, there was appropriated \$8,000 to reestablish the light at this place and the United States attorney has commenced proceedings in condemnation, to obtain title to the site required for the light.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

718. Sand Island, Alabama.	743. Chefuncte River, Louisiana.
719. Sand Island Beacon, Alabama.	747. Pass à l'outre, Louisiana.
720. Mobile Point, Alabama.	753. Head of the Passes, Louisiana.
726. Battery Gladden, Alabama.	764. Timbalier, Louisiana.
727. Horn Island, Mississippi.	775. Sabine Pass, Louisiana.
732. Ship Island, Mississippi.	777. Bolivar Point, Texas.
734. Cat Island, Mississippi.	779. Half-Moon Shoal, Texas.
735. Merrill Shell Bank, Mississippi.	780. Red Fish Bar, Texas.

LIGHT-SHIPS.

773. *Trinity Shoal Light-Vessel, No. 43, Gulf of Mexico, Louisiana.*—Some new chain was supplied. A new windlass was purchased and will be put in soon. A new set of boiler tubes will also be put in. The vessel is well kept.

776. *Galveston Light-Vessel, No. 28, Galveston Bay, Gulf of Mexico, Texas.*—This vessel is in good condition and well kept.

DAY OR UNLIGHTED BEACONS.

The beacons are in fair condition.

FOG SIGNAL OPERATED BY STEAM OR HOT-AIR ENGINES.

773. *Trinity Shoal Light-Vessel, No. 43, Gulf of Mexico, Louisiana.*—The 12-inch steam whistle was in operation 135 hours, and consumed about 5 tons of coal.

Eighth District.**BUOYAGE.**

The buoyage of this district is in a satisfactory condition. Repairs were made to 27 iron buoys by contract. Some 180 fathoms of chain were received during the year and a further supply is yet to be furnished. A good supply of chain for the light-vessels is on hand.

DEPOT.

Port Eads, Louisiana.—The coal shed and wharf are in good condition. The buoy shed has settled considerably. The cisterns now in use are old and leaky, too small for the needs of the service, and larger ones are needed. An oil house is needed at this place for the storage of the oil, as it is dangerous to store the oil in the main depot with other supplies and there are no appliances for extinguishing a fire. The wharves are in good order. The light-house land runs nearly 405 feet up the river from the end of the wharf, and this wharf should be extended at least 200 or more feet up the river, and the present depot building also should be extended. When there is a full supply of spare chains, sinkers, etc., on hand, these articles have to be stretched along the front wharf, thus in a manner obstructing it. If the wharf and depot are extended it will relieve the foundation of a good deal of weight and thereby insure its safety. Its repair will be commenced soon. The supplies stored in this depot are in good condition and cared for as well as circumstances will permit.

TENDERS.

The Pansy.—This steamer was employed during the year in attending to the buoyage of the district, supplying light-vessels and stations with rations, fuel, and general supplies, transporting general supplies, received from the general depot, from New Orleans to the depot at Port Eads, and conveying the inspector on his quarterly visits of inspection to the vessels and stations in the district. During the year she placed 2 buoys, replaced 9, changed 70, cleaned and painted 109, recovered 6, and did seven days' work at the buoy and supply depot. She steamed 10,020 miles and consumed about 550 tons of coal. A contract is now being made for repairs to the boiler. The engines are in a bad condition and are liable to give out at any time, and that time may be at a critical moment. This tender should always be in a first-class condition, as the district comprises a large extent of seacoast, and in the western portion of it especially the distances between the stations are great, and there is no harbor between the Mississippi River passes and Galveston except Sabine Pass that she can enter, and this only in the daytime.

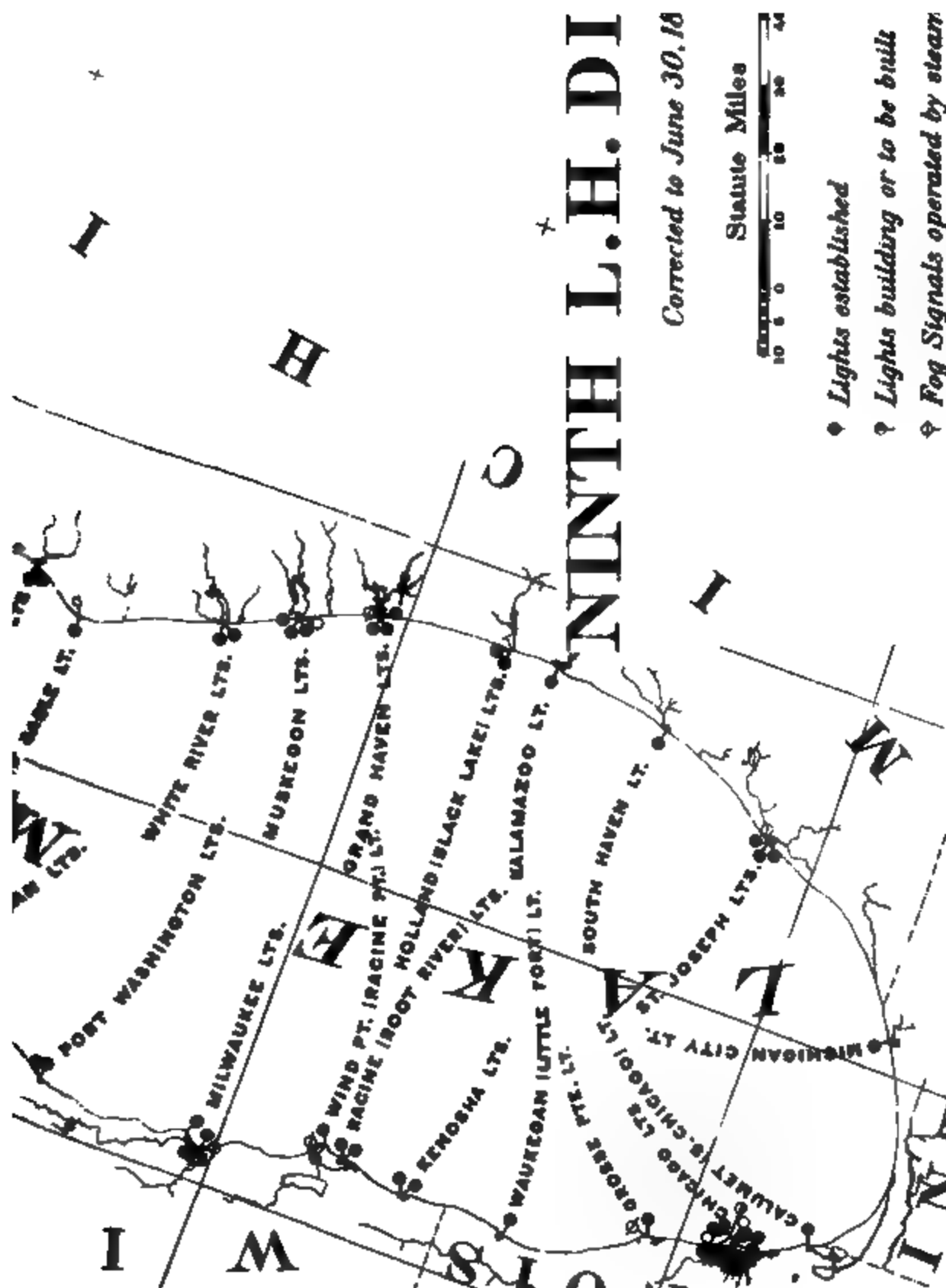
The Arbutus.—This steamer was actively employed during the year in making repairs to the light-houses in the seventh and eighth districts.

Eighth District.

During the year the tender was docked and the old metal was taken off and replaced with new where required. Calking was done where necessary, and other minor repairs were made. A new starboard crank pin shaft was put in, the machinery was thoroughly repaired, and a new pair of composition propeller wheels was put on. During the year she ran 15,168 miles and consumed 639 tons of coal. The tender is in excellent condition.

The Clover.—This vessel was also actively employed during the year in making repairs to the various light-stations in the seventh and eighth districts until the completion of repairs at Key West light-station during the month of April last, when she sailed for West End, La., in Lake Pontchartrain, where the crew was discharged and the tender left in charge of two watchmen. She will possibly be replaced in commission in the latter part of July, 1891. A few slight repairs were made and a steam windlass was furnished for use in hoisting anchor.

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NINTH DISTRICT.

The ninth district includes all aids to navigation on Lake Michigan, Green Bay, and tributary waters, and the Straits of Mackinac, west of a line drawn across the straits from Old Mackinac Point.

Inspector.—Commander Charles E. Clark, U. S. Navy, to April 30, 1891; since then Commander Nicoll Ludlow, U. S. Navy.

Engineer.—Maj. William Ludlow, Corps of Engineers, U. S. Army.

There are in this district—

Light-houses and beacon lights.....	90
Fog signals operated by steam.....	14
Fog signals operated by clockwork.....	6
Buoys in position.....	64
Steamer <i>Daklia</i> , buoy tender, and for supply and inspection.....	1
Steamer <i>Warrington</i> , for repair and construction.....	1

LIGHT-HOUSES.

962. *Old Mackinac Point, Straits of Mackinac, Michigan.*—The act approved March 2, 1889, appropriated \$5,500 for this steam fog signal. The land was purchased and the deed was recorded in June, 1890. Work was begun July 1 and completed October 9, 1890. The signal was operated for the first time on November 5, 1890. The well for the water supply for the fog signals was deepened in January to provide a better supply. An addition to the landing crib 12 feet square was built under the direction of the keeper to aid in the landing of fog-signal supplies. This was completed in June. The act approved March 3, 1891, appropriated \$20,000 for the construction of a light-house. At the end of June, 1891, the preliminary plans were nearly completed.

965. *White Shoal, Lake Michigan, Michigan.*—The light-ship, with fog signal, is being built under contract, as hereinafter stated.

966. *Simmons Reef, Lake Michigan, Michigan.*—The act approved March 2, 1889, appropriated \$60,000 for the establishment of a light and fog signal on this reef. This amount was inadequate and an additional appropriation was asked. Pending this the act approved March 3, 1891, authorized the use of the \$60,000 already appropriated for building three light-ships, to be stationed respectively on Simmons Reef, White Shoal, and Grays Reef. The ships are of special design; they have wooden hulls, are 100 feet long, 18 feet beam, and 14 feet deep, with steam power for propulsion and fog signal, and are to cost \$15,000 each. The light-ships, which are being built by contract, will be on their stations during this season.

967. *Grays Reef, Lake Michigan, Michigan.*—The light-ship, as above stated, is now being built under contract.

969. *Skilligallee, Lake Michigan, Michigan.*—The work of substituting 10-inch steam fog whistles for the steam sirens that were in use at this

Ninth District.

station was commenced on October 4, and on November 14, 1890, was completed.

971. *Beaver Island, Lake Michigan, Michigan.*—The act approved March 2, 1889, appropriated \$5,500 for the establishment here of a steam fog signal. The materials and men were landed on the island August 27, 1890, and the building of the signal, including a landing and water-supply crib, 8 feet wide, 32 feet long, and 27 feet high, was completed November 30. As the signal at Skilligallee was a siren, and it was thought best to have a steam whistle at that station, the sirens were transferred to Beaver Island. A tramway, 142 feet long and 5 feet wide, for landing coal and supplies, was built to lead from the landing to the signal. Some 167 feet of sidewalk, 3 feet wide, were laid around the tower and the dwelling was rebuilt. The platform and stairs leading from the tower on the bluff to the lake, which were rotten and in a dangerous condition, were renewed. Five flights of stairs and five platforms, 120 lineal feet long in all, were entirely renewed. A hand rail for the inside tower stairs was put in place and many minor repairs were made.

972. *Little Traverse, Lake Michigan, Michigan.*—Connection was made with the city mains to furnish the station with a supply of water for domestic purposes and for protection against fire. The supply of water is good. Various repairs were made.

974. *South Fox Island, Lake Michigan, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The passage between South Fox and Manitou Islands is much used by vessels, which, because of the outlying shoals south of the Fox, either keep near the South Fox Island light or off the north end of Manitou. It is therefore recommended that a steam fog signal be established at South Fox Island light-station, Lake Michigan, at a cost not exceeding \$5,500, and that an appropriation of that amount be made therefor.

Some repairs were made.

975. *Grand Traverse, Lake Michigan, Michigan.*—A two-story wooden barn was built. It is 18 feet wide, 24 feet long, and 16 feet high, with a pitched shingle roof.

978. *Point Betsey, Lake Michigan, Michigan.*—The act approved March 3, 1891, appropriated \$5,500 for the establishment here of a steam fog signal. Contract was made on June 23, 1891, for the construction of the duplicate fog-signal boilers and machinery. A new fourth-order lens for this station was ordered last winter.

979. *Frankfort Pierhead, Lake Michigan, Michigan.*—A fog bell is needed as an adjunct to the pierhead light in thick weather when the light can not be seen. The Board does not favor the use of bells for such purposes as a rule, but it makes an exception in this case for obvious reasons. It is estimated that a bell with proper striking apparatus

Ninth District.

tus, to be operated by machinery, can be adjusted to the tower at a cost not exceeding \$1,000, and it is recommended that an appropriation of that amount be made for this purpose. Some repairs were made.

980, 981. *Portage Lake Pierhead Range, Portage Lake Harbor, Lake Michigan, Michigan.*—Portage Lake occupies a position in the dangerous bight between Point Betsey and Big Point Sable, and for several years has been under improvement by the United States as a harbor of refuge for the general commerce of the lake. The width of entrance, 380 feet, is exceeded by but one of the harbors, Grand Haven, on the east shore of the lake, and while the works still lack much of their projected development and the entrance depth is as yet by no means what it is designed to secure, the completion of the harbor will furnish a valuable shelter in case of need, and it has been shown that in its present condition the harbor would be of service if it were so marked by lights as to permit its use after dark. Plans and specifications were made therefore for the establishment of a gasoline pierhead fixed red light of the fifth order, and a fixed red tubular lantern pierhead range-light at this place. Construction was begun on March 16 and completed early in May. The lights were exhibited for the first time on the night of April 30, 1891. The lights stand near the outer end of the north pier, this being the only portion of either pier that would support them. The best water is now near the north pier, but it is probable that when the construction is completed the channel will occupy a more nearly central position, and inasmuch as the harbors on the east coast are in general lighted on the south side, the Portage Lake lights should be placed on the south pier for the sake of uniformity. The focal plane of the main light is 40 feet above the level of the lake, and it can be seen from 2 to 3 miles in clear weather. The structure is a square wooden tower painted white, surmounted by a black iron lantern with a brown parapet. The lower part of the tower is open framework, but the upper part is inclosed for a watchroom. A dwelling for the keeper should be erected on the south shore, as there are but few houses in the vicinity which could be used as quarters. The estimated cost of the building proposed is \$3,500, and it is recommended that an appropriation of that amount be made for this purpose.

986, 987. *Ludington Pierhead Range, Lake Michigan, Michigan.*—After the completion of the extension of the south pier in the fall of 1890 the pierhead light was moved out 750 feet to the third crib from the end and converted into a gasoline light, with a tubular lantern range light at the outer end. A guide rope, stapled to the mooring posts, was provided to aid the keeper in reaching the light. A pierhead light was erected at the outer end of the north pier, carrying a tubular lantern on a post 25 feet above the lake level. The unused elevated walk now on the west pier at Michigan City will be taken down and rebuilt at Ludington to prolong the walk there.

Ninth District.

The following recommendation, which was made in two annual reports, is renewed:

The work of extending the south pier, on which a light was first shown in 1870, is progressing rapidly, and will soon be completed. It has long been needed here, but it was deemed impracticable to have it finished. It is estimated that the signal will cost \$5,500, and that this amount be appropriated therefor.

There is no dwelling at this station for a keeper. The Board estimates that one can be built for \$1,000. It is recommended that an appropriation of this amount be made.

988. *Pont Water Pierhead (front), Lake Michigan.* A tubular lantern 25 feet above the lake level at the outer end of the south pier, to form with the main pier a light for entering the harbor. The light was shown on the 15th of May, 1890, for the first time.

995. *Muskegon Pierhead, Lake Michigan, Michigan.* The walk of elevated walk were rebuilt. A post for supporting the light shown from the post at the outer end of the pier was placed midway between the beacon and the pier, and an additional wire for operating the light was run. Iron brackets for supporting the operating wire were placed at the light and intermediate posts, and various minor repairs were made.

998. *Grand Haven Pierhead, Lake Michigan, Michigan.* The light posts for the use of the light-house tender were rebuilt. Near the fog-signal house. An 8-foot wooden tank was built for the signal houses for a water supply for the fog-signal. Various repairs were made.

999. *Holland Pierhead (front), Lake Michigan, Michigan.* The lantern at the outer end of the south pier, from which was shown the light, was carried away on the night of September 1st, 1890, while trying to enter the harbor during a heavy fog. The post was rebuilt. A temporary light was shown from the post during the reconstruction.

1005. *St. Joseph Pierhead, Lake Michigan, Michigan.* A shed was built. Various repairs were made. The Board's recommendations, made in the Board's last annual report, are renewed.

This port is about midway between Chicago and Grand Haven, and is a very important lake commerce. During thick weather steamers find it difficult to enter the harbor, as the sound of the bell at the light-tower is ineffective, as a shoal lies off the entrance and close to the track of the Chicago, outside of which the bell is barely audible, but the Board considers that a steam fog signal is needed at this port. It is estimated that the signal will cost \$5,000. The Board recommends that an appropriation of this amount be made therefor.

1008. *Chicago Breakwater (south), Lake Michigan.* The light was converted into a gasoline light. The gas main was laid from the shore to the light.

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in the watchroom and all pipe fittings and connections were made. This new light was tested on the night of January 24, 1891, and found to be satisfactory.

1011. *Chicago Pierhead, Lake Michigan, Illinois.*—This light, on February 10, 1891, was converted into a gasoline light. The striking apparatus of the fog-bell machinery was taken apart, cleaned, and put into good condition. A tubular-lantern light was established on the east end of the pier to form a range, and a cable 82 feet long was stretched from the tower to the post. The height of the post above the pier deck was 24 feet.

1012. *Chicago River, Lake Michigan, Illinois.*—This station was scorched by a fire, which started in the adjoining lumber yard in the early part of August. The damage done was repaired, and at the same time the station was overhauled and put into good order.

1013. *Chicago Harbor, Lake Michigan, Michigan.*—The act approved August 30, 1890, appropriated \$15,000 additional to the \$36,000 in the act approved March 2, 1889, making a total of \$51,000, a small enough sum considering that the light will be the leading one in the most important harbor on the lakes, and the act required its construction on an independent crib site in 23 feet of water near the end of the outer breakwater, and 2 miles from shore, and to include a fog signal also. Plans and specifications for the tower were made, and in May proposals were asked for the construction, delivery at the site, and the completion of the iron tower and its adjuncts, and contract was made with the lowest bidder. Bids for building the duplicate fog-signal boilers and machinery were opened June 1, and contract therefor was made on June 23, 1891, for their delivery at the light-house depot, Detroit, on September 1, 1891. The plans, etc, for the superstructure of the foundation crib were being prepared at the close of the fiscal year.

1022. *Racine (Root River), Lake Michigan, Wisconsin.*—A well 60 feet deep was drilled with a 2½-inch pipe, and a pump and sink were provided to furnish the station with a good supply of water for domestic uses.

1025. *Milwaukee Pierhead, Lake Michigan, Wisconsin.*—The damage done to the station by the violence of the sea on the night of January 1, 1891, was repaired. Other necessary repairs were made.

1029. *Sheboygan Pierhead, Lake Michigan, Wisconsin.*—Four posts of the elevated walk, which were torn out by the Goodrich Transportation Company steamers, were replaced, and the cost was paid by the Company. Another post, which was accidentally broken by a sailing vessel, was also replaced and five rotten ones were renewed.

1031. *Manitowoc Pierhead, Lake Michigan, Wisconsin.*—The light-house which was moved somewhat out of position during the storms of last winter, was replaced and new braces and a main post were provided. Various repairs were made.

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1033. *Twin River Point, Lake Michigan, Wisconsin.*—The material workmen for the establishment of this fog-signal station were laid here on July 17, 1890. A concrete floor was laid in the signal house, 290 feet of sidewalk, 2 feet wide, were laid from the dwelling to the signal house, and to within 30 feet of the lake shore. The fog signal was started on October 10, 1890. Various repairs were made. The tower, owing to defective brick used, is in bad condition. Plans for banding and staying the structure are under consideration.

1034. *Keewaupee Pierhead, Wisconsin.*—A 20-foot wooden boat house was built.

1035. *Ahnapee Pierhead, Lake Michigan, Wisconsin.*—The act approved March 3, 1891, appropriated \$2,500 for range or pier lights at entrance. These will be erected this season.

1036. *Sturgeon Bay Canal Pierhead, Wisconsin.*—Some 310 lineal feet of tight board fence were built to protect the station against the drift sand. The fog-signal machinery received a thorough overhauling and various repairs were made. The following recommendation which was made in the Board's last annual report is renewed:

A large and increasing commerce passes the canal light, both up and down lake and through the canal to and from Green Bay. The present light on the pierhead is flashing red of the sixth or smallest order, and is inadequate in intensity and elevation. The establishment of a new coast light on shore near to the keeper's dwelling has already been recommended, and that recommendation is renewed. The estimated cost is \$20,000, and it is recommended that an appropriation of that amount be made therefor.

1040. *Porte des Morts (Pilot Island), Wisconsin.*—A boat landing 100 feet wide and 48 feet long, was built on the west side of the island and completed in July. It was built of logs picked up along the shore of the adjacent islands, and filled with bowlders taken from the island. The well of the fog signal No. 2 was deepened and enlarged at the bottom, and the well of signal No. 1 was also enlarged to provide a better water supply for the fog signals. The keeper used 10 pounds of dynamite and blasted the rock in front of the boat landing, to provide deeper water, in December, 1890. The characteristic of the light will be changed from fixed white to fixed red, as soon as the lens is obtained. The following recommendation made in the last two annual reports of the Board is renewed:

Range lights and a fog signal on the southwest side of Plum Island will be a valuable addition to the aids to navigation in the Porte des Morts Passage. The Board is of opinion that they should be established on Plum Island, and has recommended in its report of 7th January, 1890. They can be built for \$21,000, and the Board renews its recommendation that an appropriation of that amount be made therefor.

1041. *Pottawatomie, Wisconsin.*—The materials for a boat house ways, including a 4-ton hoisting winch, were bought and delivered.

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the light-house depot, Detroit, and will be landed at the station soon, when the work will be done.

— *Little Gull Island, St. Martin Passage, entrance to Green Bay, Lake Michigan, Michigan.*—St. Martin Passage, though relatively narrow, is deep and clear, and could be made by a light and fog signal on Little Gull Island, and another on the northwest end of St. Martin, a very excellent passage. It is proposed, therefore, to establish a light and fog signal on Little Gull Island. It is estimated that these can be built for \$20,000, and it is recommended that an appropriation of that amount be made for this purpose.

— *St. Martin Island, St. Martin Passage between St. Martin and Little Gull Islands, entrance into Green Bay, Lake Michigan, Michigan.*—The passage between St. Martin and Little Gull Islands, if marked by lights and fog signals, would be much safer than Poverty Island Passage, as the entrance is capacious and unobstructed. A fourth-order light and a fog signal should be established on the northwest end of St. Martin Island. It is estimated that they can be built for \$15,000, and it is recommended that an appropriation of this amount be made for that purpose.

— *Eleven-Foot Shoal, Green Bay, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The act of March 2, 1889, authorized the construction of a light on Eleven-Foot Shoal at a cost of \$60,000, but made no provision for a fog signal. One is as necessary as the other, and both are required for the large commerce out of Little Bay de Noquette. The amount named in the act should be increased from \$60,000 to \$100,000. The Board recommends that an appropriation of \$100,000 be made for this purpose. A light-ship can be hired for the season at a cost of \$2,500. It is recommended that measures be taken to temporarily maintain a floating light here until the light and fog signal are put into operation. The Board recommends that an appropriation of this amount be made therefor.

1043. *Seul Choix Pointe, Lake Michigan, Michigan.*—In the absence of any additional appropriation for this station, a revised estimate of cost for its construction was made and directions were given for the purchase of the material in open market and for doing the work by hired labor. The work will be commenced soon, and it is hoped that the station will be completed this fall. A 4-ton hoisting winch was purchased for use in connection with the keeper's boat. The following recommendation, which was made in the Boards' last annual report, is renewed:

It has now become evident that the interests of navigation require the establishment of a steam fog signal here. It will cost not exceeding \$5,500. The Board recommends that an appropriation of that amount be made therefor.

1044. *Squaw Island, Lake Michigan, Michigan.*—The act approved March 3, 1891, provided \$25,000 for establishing a light and fog signal on Squaw Island to mark the northern passage leading through the

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Straits of Mackinac. Contract was made for the construction of the duplicate fog-signal boilers and machinery on June 23, 1891, and for its delivery on September 1, 1891, at the light-house depot, Detroit. Negotiations are in progress for the purchase of the light-house site, and plans for the station are being prepared.

— *Gladstone, Little Bay de Noquette, an extension of Green Bay, Michigan.*—The following recommendation, made in the Board's annual reports for the last three years, is renewed:

It is stated that the plans of the Minneapolis, Sault Ste. Marie and Atlantic Railroad, now in process of execution, will give to Gladstone the most important shipping in these waters, and that every year will augment its importance. It is stated that last year nearly 300 vessels entered that harbor, and it is expected that next year the number will exceed 1,000. A light either on Sanders Point or Squaw Point will answer the purpose of guiding into Gladstone Harbor, at least for the present. It is estimated that a site can be obtained and proper structures can be erected for the establishment of a proper light at a cost of \$10,000.

Recommendation is made that an appropriation of that amount be made therefor.

1046. *Escanaba, on Sand Point, Green Bay, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

A steam signal here is not essential, as the navigation of Little Bay de Noquette is quite unobstructed, and with a steam whistle on Eleven-Foot Shoal a vessel should be able to reach the point with reasonable safety. A fog bell struck by machinery in the light-station at Escanaba, on Sand Point, would be a valuable addition to the service of this station. It can be set up for about \$1,100. It is recommended that an appropriation of this amount be made therefor.

Repairs were made.

1047. *Cedar River, Michigan.*—A keeper's dwelling, with outbuildings and elevated walk, was built on a site donated by Hon. Jesse Spaulding, of Chicago. Portions of the lot were filled in and graded. The lot was entirely fenced in with 275 feet of board fence and 427 feet of picket fence. A brick cistern was put in the cellar. The ground immediately surrounding the dwelling for a space 170 feet long and 100 feet wide was filled in to raise the grade so as to slope away from the buildings. A brick oil house was built with a capacity of 300 gallons.

Range lights were erected on the east pier 500 feet apart. The lights were exhibited on the opening of navigation, 1891. Walks around the building are being laid and the lake front of the lot is being graded. The work was still in progress when the year closed.

1051. *Chambers Island, Wisconsin.*—This station was repaired in October. The boathouse was moved 16 feet nearer the lake shore and new boatways provided. The old landing crib was removed; a new one was built, and the old crib was placed at the outer end. The sidewalk around the tower and dwelling was renewed. A well 45 feet deep was driven, and an open frame tower 37 feet high, 16 feet square at the base,

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was erected over it, to carry a 10-foot windmill with a force pump and a tank of 2,250 gallons' capacity, to provide the station with water for domestic uses and for fire protection. Materials for a two-story barn, and minor repairs to the keeper's dwelling, were delivered at the station.

1052. *Menominee Pierhead, Michigan*.—The fourth-order lens, to take the place of the present fifth order, was delivered at the station last spring. It will soon be set up.

1054. *Sherwood Point, Wisconsin*.—The act approved August 30, 1890, appropriated \$100 for a small piece of land required for an approach to the station in front. The land was purchased and the deed was duly recorded. A woodshed was built and various repairs were made. A machine fog bell is to be furnished to this station.

1056. *Dunlap Reef Range (rear), Wisconsin*.—The deck of the lighthouse crib was taken up and entirely renewed; the fence surrounding the buildings on the crib was rebuilt. The boat slide, leading from the landing crib to the lake, was rebuilt and lowered, and other minor repairs were made.

— *Menasha, Green Bay, Wisconsin*.—The following recommendation, which was made in the Board's last annual report, is renewed:

It is now difficult to make the Menasha River at night, on account of the cut through the rock, and the earth cut, which is found to be quite intricate. To meet this difficulty it is proposed to establish here two range lights, one to be placed on the site of the old Menasha Light, which was discontinued under the operations of the act of March 3, 1859, which site is still Government property; the other to be placed on the northeast end of Doty Island, adjacent to the channel which was dredged out in 1887.

It is estimated that these range lights can be established for a sum not to exceed \$500, and it is recommended that an appropriation of this amount be made therefor.

REPAIRS.

Repairs more or less extensive were made at the following-named stations:

963. McGulpin Point, Mich.	1009. Chicago Breakwater (north), Ill.
964. St. Helena, Mich.	1018. Grosse Pointe, Ill.
968. Waugoshance, Mich.	1019. Waukegan, Ill.
970. Beaver Island Harbor, Mich.	1020. Kenosha, Wis.
973. Charlevoix Pierhead, Mich.	1021. Kenosha Pierhead, Wis.
977. South Manitou, Mich.	1024. Wind Point, Wis.
978. Point Betsey, Mich.	1026. Milwaukee, Wis.
983. Manistee Pierhead, Mich.	1027. Port Washington Pierhead, Wis.
984. Grande Pointe Au Sable, Mich.	1028. Port Washington, Wis.
990. Petite Pointe Au Sable, Mich.	1030. Sheboygan, Wis.
992. White River Pierhead, Mich.	1039. Cana Island, Wis.
1001. Kalamazoo Pierhead, Mich.	1042. Poverty Island, Mich.
1002. South Haven Pierhead, Mich.	1045. Point Peninsula, Mich.
1006. Michigan City, Ind.	1050. Eagle Bluff, Wis.
1007. Calumet Pierhead, Ill.	1057. Tail Point, Wis.

Ninth District.**GENERAL PURPOSES.**

The necessary tools and pipe fittings for the erection and repair of steam fog signals in the ninth and eleventh light-house districts were purchased. Spare lantern glass for various stations was ordered. A quantity of black pipe, tools, bolts, nuts, rods, washers, 270 feet of boiler tubes, and 30 sets of grate bars, were purchased and delivered at the light-house depot, Detroit, for the purpose of making repairs and renewing wornout parts of fog-signal apparatus when needed. Twelve 10-inch fog whistles were ordered for general use in connection with fog-signal apparatus. Necessary tools and materials to make repairs and improvements required at stations in the ninth and eleventh districts, were bought and sent to the light-house depot, Detroit, in June, 1890.

OIL HOUSES.

The metalwork for five circular iron oil houses was obtained in April, 1890, by contract. The material required for the erection of six circular iron oil houses was purchased and delivered at the light-house depot, Detroit, in June. The use of isolated oil houses is very desirable to avoid the risk of and damage from fire. But a few of the stations in the district are so equipped. About one hundred are needed.

LIGHT-SHIPS.

The three light-ships now under construction at Toledo will probably be on their stations at Simmons Reef, White Shoal, and Grays Reef in October of this year. These vessels are well constructed, of good material, and get to and from their stations with their own steam, the only light-ships in any service to which this is possible.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

962. *Old Mackinac Point, Michigan.*—The 10-inch steam whistles in duplicate have been in operation 300 hours since the time of their establishment, October 1, 1890, consuming 10 gross tons of coal and 18 cords of wood.

968. *Waugoshance, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation 392 hours, and consumed 22 gross tons of coal.

969. *Skilligallee, Michigan.*—The first-class steam sirens, in duplicate, were in operation 268 hours, and consumed 26 gross tons of coal. On November 1, 1890, 10-inch steam whistles, in duplicate, were substituted for the sirens.

971. *Beaver Island, Michigan.*—The first-class steam sirens, in duplicate, have been in operation 200 hours since the time of their establishment, December 6, 1890, consuming 7 gross tons of coal and 7 cords of wood.

Ninth District.

977. *South Manitou, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation 245 hours, and consumed 13 gross tons of coal and 3 cords of wood.

983. *Manistee Pierhead, Michigan.*—The 10-inch steam whistles, in duplicate, were operated 338 hours, and consumed 30 gross tons of coal and 28 cords of wood.

998. *Grand Haven Pierhead, Michigan.*—The first-class steam sirens, in duplicate, were in operation 363 hours, and consumed 37 gross tons of coal and 6 cords of wood.

1018. *Grosse Pointe, Illinois.*—The first-class steam sirens, in duplicate, were in operation 239 hours, and consumed 19 gross tons of coal and 3 cords of wood.

1024. *Wind Point (Racine Point), Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation 325 hours, and consumed 19 gross tons of coal and 2 cords of wood.

1025. *Milwaukee Pierhead, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation 687 hours, and consumed 29 gross tons of coal and 5 cords of wood.

1033. *Twin River Point, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation 521 hours from the time of their establishment, October 10, 1890, consuming 5 gross tons of coal and 96 cords of wood.

1036. *Sturgeon Bay Canal Pierhead, Wisconsin.*—The 10-inch steam whistles, in duplicate, were in operation 355 hours, and consumed 36 gross tons of coal and 6 cords of wood.

1040. *Porte des Morts (Pilot Island), Wisconsin.*—The first-class steam sirens, in duplicate, were in operation 165 hours, and consumed 11 gross tons of coal.

1042. *Poverty Island, Michigan.*—The 10-inch steam whistles, in duplicate, were in operation 203 hours, and consumed 12 gross tons of coal and 4 cords of wood.

FOG SIGNALS OPERATED BY CLOCKWORK.

995. *Muskegon Pierhead, Michigan.*—This signal, a bell struck by machinery, was in operation 366 hours.

1005. *St. Joseph Pierhead, Michigan.*—This signal, a bell struck by machinery, was in operation 285 hours.

1011. *Chicago Pierhead, Illinois.*—This signal, a bell struck by machinery, was in operation 353 hours.

1031. *Manitowoc Pierhead, Wisconsin.*—This signal, a bell struck by machinery, was in operation 274 hours.

1057. *Tail Point, Wisconsin.*—This signal, a bell struck by machinery, was in operation 100 hours from the time of its establishment July 5, 1890.

Ninth District.**BUOYAGE.**

The buoyage of the district is in good order as far as it goes. Many of the buoys are put down in the spring and taken up in the fall by contract. This is owing to the necessity of sending the tender to winter at Detroit, whereby she is prevented from attending buoys in the southern part of the district until some time after navigation opens in the spring. The new depot at St. Joseph, now under contract, will, it is expected, be finished during the year. Then the need of contracting for putting down and caring for many of the buoys in the southern end of the lake will be obviated. There is need for many buoys in the northern part of the district, particularly on the main routes of travel from the Straits of Mackinac to Green Bay. The passage to the northward of the Beaver Group is the one involving fewer courses. When the light and fog-signal ships are placed on Simmons Reef, White Shoal, and Grays Reef, and when the light and fog-signal stations on Squaw Island and Seul Choix Pointe are built, they, together with the additional buoyage already authorized, will make that passage reasonably good. The waters of all the Great Lakes are very low, lower than for a generation, and many dangers are developed which previously had been unsuspected. The hydrography of Lake Michigan and Green Bay should be all gone over again carefully, especially Green Bay, the northern end and western coast, including the islands of Lake Michigan above Chicago, and the eastern coast as far south as Point Betsey, including the islands, and new and better charts should be issued. The charts now in use were first issued many years ago and are by no means up to modern requirements.

DEPOT.

The act approved March 3, 1891, appropriated \$35,000 for establishing a supply and buoy depot for the ninth light-house district at St. Joseph Harbor, Michigan. The site was donated to the Government by the Cincinnati, Wabash and Michigan Railway Company. The depot will be built this season.

TENDERS.

The Dahlia.—This steamer has been in service for so many years without any considerable repair that it is necessary now to have her completely overhauled, and a new boiler put in to make her fit for service. Last year bids were asked for, but all that were received were rejected. This year bids will be asked for earlier, and intending bidders will have the chance to examine the vessel thoroughly before putting in their bids.

The *Dahlia*, which was built in 1873 and has seen quite hard service, has nearly outlived her usefulness. The district has outgrown her

Ninth District.

powers. She has neither the speed, the power, nor the carrying capacity needed. Beside that, she burns too much coal in running her old-fashioned engines to be an economical boat.

It is deemed desirable to build a larger and faster vessel, which shall be able of herself to do the work of the district within the not too long season of navigation, and which shall be strong enough to keep at work in the young ice as long as the merchant steamers are making their trips. The number of vessels on the lakes on June 30, 1890, was, according to the Commissioner of Navigation, 3,510; and their documented tonnage was 1,063,064. The number of vessels on the lakes on June 30, 1891, was 3,600; and their documented tonnage was 1,154,870. This increase in lake tonnage calls for an increased number of aids to navigation and increased ability in the light-house tender which must care for them. It is also deemed requisite that she shall embody all the improvements in vessel construction, fittings, and the like, that have been found to be peculiarly applicable to vessels on the Great Lakes. In view of the fact that the Columbian Exposition is to be held at Chicago, the headquarters of the ninth light-house district, and the port from which the tender would hail, she should be a model light-house tender, as she would be subject to the critical examination of many officers of foreign navies, and others interested in light-house affairs, for she would of herself be one of the most characteristic exhibits of the Light-House Board. It is hoped that the *Dahlia* may be kept in working order until the new tender can be built. It is estimated that such a vessel could be built for \$95,000, and it is recommended that an appropriation of this amount be made for that purpose.

The Amaranth.—The act approved August 30, 1890, appropriated \$75,000 for a steam tender in the ninth and eleventh light-house districts. The steamer will be completed this winter, the contractor having been allowed eight months from May 21, 1891, for the purpose.

The Ruby.—This steam barge was employed during July, August, September, and October in delivering materials for construction and repairs at Old Mackinac Point, Twin River Point, Sturgeon Bay Canal Pierhead, St. Helena, Skilligallee, Beaver Island, Beaver Island Harbor, South Fox Island, Cana Island, and Cedar River light-stations, and was employed during November in transferring sirens from Skilligallee to Beaver Island light-station, Michigan.

The Warrington.—This steamer was transferred by the inspector to the engineer of the ninth and eleventh light-house districts on March 10, 1891. The hull of the tender was calked and painted. A new set of grate bars was provided for the boiler, and the machinery was thoroughly overhauled. The tender was fitted out and put in service April 1, 1891, in the eleventh light-house district.

TENTH DISTRICT.

The tenth district extends from the mouth of the St. Regis River, New York, to and including Grassy Island, Detroit River, Michigan, and embraces all the aids to navigation on the American shores of the St. Lawrence River, Lake Ontario, Lake Erie, and the Detroit River, within these limits.

Inspector.—Commander Charles V. Gridley, U. S. Navy, to June 30, 1891; since then Commander Edwin T. Woodward, U. S. Navy.

Engineer.—Maj. Lewis C. Overman, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights	71
Fog signals operated by steam	2
Fog signals operated by clockwork	5
Buoys in position	170
Steamer <i>Haze</i> , buoy tender, and for supply and inspection	1

The lights are classified as follows:

Third order	6
Three-and-a-half order	1
Fourth order	23
Fifth order	6
Sixth order	20
Tubular lanterns	1
Lens lanterns	3
Lanterns	3
Reflectors	8

Light-houses and beacon lights	*71
Spare buoys	166
New lights established	2
Buoys discontinued	1
New buoys placed	1

All of the light-stations and the buoys of the district were inspected frequently, and the stations were supplied in May and June.

The engineering operations of the fiscal year were confined almost exclusively to repairs. The only exceptions were the work of erecting circular iron oil houses, establishing steam fog signal at Cleveland, Ohio, and range lights at Grosse Isle, Detroit River, Michigan.

* Five lens lanterns are in actual use in the district, the light of that character at Charlotte Harbor, New York, being triple. A reflector light shown from the veranda at Rock Island station and a lens lantern on and near the west end of East Breakwater at Cleveland, Ohio, both of which are temporary and unlisted, are included in the above enumeration. At Maumee Bay ranges two of the reflector lights enumerated are gasoline lights, as are also two of the lanterns at Sandusky Bay ranges.

Steam or hot air
machinery



Tenth District.**LIGHT-HOUSES.**

— *Bay State Shoal, St. Lawrence River, New York.*—The following recommendation, which was made in the Board's last annual report, is renewed:

This shoal and Oak Point Shoal, which is adjacent, are well marked with buoys which serve for crossing by daylight. The current striking vessels broadside on carries them down toward the shoals, making it difficult for them to hold their course, unless the pilot has the aid of the buoys. At night, therefore, the crossing is especially difficult, and lights are needed. The act of August 2, 1888, for improving rivers and harbors, authorized a survey and examination of these shoals with a view to their removal. It is probable that an appropriation will be made for that purpose, and that lights will be required here but for a few years. As the need for vessels to cross during the night is increasing each year, it is recommended that these shoals be marked by two temporary floating lights. It is estimated that two small flats, complete with mast, anchors, etc., with two sets of lantern lights, will cost \$800, and it is recommended that an appropriation of that amount be made therefor.

1064. *Rock Island, St. Lawrence River, New York.*—The west stoop of the dwelling was inclosed with a permanent partition, fitted with glazed sash so as to utilize the space (13 feet by 14 feet) during the winter months and at the same time to exclude the cold. The floor, joists, and posts of the stoop were entirely renewed. A timber crib, 41 feet long, 5 feet in height, and 6 feet in width, was constructed across the mouth of the cove on the west side of the island to prevent the sea from encroaching upon the island. Various repairs were made.

— *Carlton Island, St. Lawrence River, New York.*—The following recommendation which was made in the Board's last annual report is renewed:

Several petitions for the establishment of a light on this island have been received the past eight years, notably in 1883 and in 1888, but on each occasion has been made the subject of an adverse report. The number and size of the vessels used in the navigation of the St. Lawrence River has increased yearly. The character and demands of this trade have also changed, and where heretofore vessels would lay up rather than make night passages, they are now compelled by close competition to economize time and do so. The channel for large vessels near Carlton Island crosses from the American to the Canadian side, and is both dark and obscure. The establishment here of a small light-station, similar to that at Cross-Over Island, St. Lawrence River, at a cost of \$8,600, is suggested, and an appropriation of that amount is recommended therefor.

1066. *Tibbetts Point, St. Lawrence River, New York.*—The following recommendation which was made in the Board's last annual report is renewed:

This light being at the entrance to St. Lawrence River, it is important that its location be made known at all times and in all kinds of weather. The establishment of a steam fog signal at this station, at an estimated cost of \$4,300, is suggested, and it is recommended that an appropriation of that amount be made therefor.

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1068. *Galloo Island, Lake Ontario, New York.*—A summer kitchen, storage room, and woodshed combined, was built, 16 by 24 feet in plan. A 9-inch vitrified pipe was placed in the well and extended above the ground and was properly cemented. A small ice house was erected. Various repairs were made.

The following recommendation which was made in the Board's last annual report is renewed:

This is an important light near the lower end of Lake Ontario. It marks the outer edge of a group of islands and numerous shoals before reaching the St. Lawrence River, or on the way to Sacketts Harbor. Vessel men need to locate this light as soon as possible; as fog and thick weather frequently prevail, especially in the autumn, its position should be made available by a fog signal. It is therefore recommended that a steam fog signal be established at this station at a cost not to exceed \$5,700, and that an appropriation of that amount be made therefor.

— *Salmon River, entrance to Port Ontario, Lake Ontario, New York (discontinued).*—A custodian was appointed at a nominal salary. The appointment was made necessary by the death of a former keeper who had occupied the premises since the light has been discontinued, 1859. The site will in due time be surveyed and platted.

1070. *Oswego, entrance to Oswego Harbor, Lake Ontario, New York.*—The decking of the west half of the old west breakwater for a distance of 60 feet, continuous, by 31 feet in width, was taken up and replaced with new material, as well as the decayed timbers in the face walls of the breakwater. The stone, 5 cords, which had washed out from one of the pockets of the crib work was replaced by stone taken from one of the counterforts in lee of the pier running shoreward from the tower. The boat landing, resting on piles 1 foot above water, at the west face of the south end of the breakwater, in front of the boathouse, was rebuilt. For this purpose the good material was used which was saved from repair made to the breakwater. The damage done by the barge *Mohawk* on April 25, 1891, to the pile protection on the channel face of the west breakwater, was repaired at a cost of \$43.44, for which amount a demand was made upon the owners of the barge, who, on July 13, 1891, remitted the amount, which was duly transmitted to parties to whom it was due. Various repairs were made.

1071. *Oswego Breakwater, entrance to Oswego Harbor, New York.*—The following recommendation which was made in the Board's last annual report is renewed:

Vessel men complain that they fail to hear this bell ring when the evidence of the keeper proves that it was rung. Captains report that at times they are within half a mile of the bell before they hear it. This uncertainty of a bell as a fog signal is generally admitted. The substitution of a steam fog signal for the bell is therefore recommended. It is estimated that it can be established for \$4,300, and it is recommended that an appropriation of that amount be made therefor.

1072. *Fair Haven, entrance to Little Sodus Bay, Lake Ontario, New York.*—Contract was made for furnishing the material and labor neces-

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sary for rebuilding 720 feet of the elevated walk on the west pier. Some 150 feet, not continuous, of the outer end of the elevated walk was repaired. For this purpose the good material saved from the portion of the walk rebuilt was used. Various repairs were made.

1074. *Big Sodus, at Sodus Point, Lake Ontario, New York.*—The metalwork for a circular oil house, which was furnished and delivered under contract at Cleveland, Ohio, was delivered to the station by the tender. The house will be erected at an early date. Various repairs were made.

1075. *Big Sodus Outer Beacon, on the outer end of the west pier, Big Sodus Bay, Lake Ontario, New York.*—Some 660 lineal feet of elevated walk on the west pier were rebuilt by contract.

1077. *Genesee, entrance to Charlotte Harbor, mouth of Genesee River, Lake Ontario, New York.*—Congress, by the act approved March 3, 1891, appropriated \$4,300 for the establishment of a steam fog signal in place of the bell. Joint bids will be asked for a steam fog signal for this station, and for one at Ashtabula, Ohio, when the pier work at the latter harbor is ready to receive it.

1078. *Charlotte Harbor Range Light, west pier, Lake Ontario, New York.*—The tubular lanterns were replaced by lens lanterns and shown for the first time on October 19, 1890. The five tubular lanterns were returned to the general supply depot. Various repairs were made.

— *Braddock Point, Lake Ontario, New York.*—Congress, by the act approved March 3, 1891, appropriated \$20,000 for the establishment of a third-order light, in the vicinity of this point. A visit to the locality will be made soon to determine upon a suitable site for marking the point.

1081. *Thirty-Mile Point, 30 miles east of the mouth of the Niagara River, Lake Ontario, New York.*—The metalwork for a circular oil house of 225 gallons' capacity, which was furnished and delivered by contract at Cleveland, Ohio, was taken aboard and delivered by the tender at the station. The oil house will be erected at an early day. Permission was given to the assistant keeper to build a small stable on the east side of the barn without expense to the United States, and with the understanding that when vacated the property is to revert to the Light-House Establishment. Various repairs were made.

1082. *Olcott, west pier, entrance to Olcott Harbor, Lake Ontario, New York.*—A contract was made for rebuilding the entire elevated walk on the west pier. Various repairs were made.

— *Wilson Harbor, Lake Ontario, New York.*—The following recommendation, which was made in the Board's last annual report, is renewed:

Within the past year certain Canadian parties have made investments and improvements in land adjoining the harbor and mouth of Wilson Creek, otherwise Twelve-Mile Creek, to make a summer resort and pleasure grounds. They own a steamer which makes bidaily trips between Wilson, N. Y., and Toronto, Canada,

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from about June 1 to October 15, and they propose to put on a second steamer during this coming summer. The extension of a branch railroad from Lockport via Wilson to Wilson Harbor is also projected. When the steamer reaches Wilson Harbor after nightfall and when weather is thick or foggy it is difficult to make the harbor. They are obliged to "pick up" Olcott Light, which is 6 miles to the eastward, and then work slowly westward along the shore until they find the entrance between the piers at Wilson. In view of the possibility of an accident, with probable loss of life, it is deemed necessary that a temporary pier-light of the sixth order be erected on the outer end of the east pier at Wilson Harbor. It is estimated that this can be done for \$2,500. Recommendation is made, therefore, that an appropriation of this amount be made therefor.

1083. *Fort Niagara, Niagara River, Lake Ontario, New York.*—The superstructures of three timber jetties, protecting the river front of the reservation, were rebuilt. The timber for this purpose was purchased and delivered in the fiscal year 1890. The 100 drift bolts used in this work were taken from the destroyed superstructure of the pier at Oswego, N. Y.

1085. *Niagara River, rear range, New York.*—This range was taken down and a temporary one was erected farther up-stream to range with the front range, which was moved a year ago to such position as to make them serve to guide vessels through the channels which are being widened and deepened. A contract was made June 29, 1891, to furnish, deliver, and erect a skeleton iron tower to take the place of the temporary one, and finally to serve for a permanent one as soon as the improved channel is completed.

1086. *Horseshoe Reef, entrance to Buffalo Harbor, New York.*—The stone ballast which had partially disappeared from one of the pockets of the crib was replaced by stone collected from the beach in front of the shore light. Various repairs were made.

1087. *Buffalo Breakwater, north end, Lake Erie, New York.*—The following recommendation, which was made in the Board's last annual report, is renewed:

A bell is used as a fog signal at this light station. It is ineffective. It is therefore suggested that it be replaced by a steam fog signal at a cost not exceeding \$4,300, and it is recommended that an appropriation of this amount be made therefor.

1088. *Buffalo, entrance to Buffalo Harbor, New York.*—Some 236 lineal feet of plank walk, 4 feet in width, around the keeper's dwelling, were relaid with new material. The tight board fence, 176 feet long, inclosing the river front of the reservation, was rebuilt. The planking on top of the pile protection in front of the dock was replaced with new material. Since the additional row of sheathing plank was placed around the entire slip for the tender, and the space between the double sheathing of the pile revetment was filled with cinders, no further settlement of the foundation of the dwelling has occurred. Various repairs were made.

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1090. *Dunkirk Pierhead, Lake Erie, New York.*—The breach, made by the winter gales of 1889 and 1890 to the substructure of the pier which supports the block stone superstructure of the tower, was repaired. The breach was at the northeast corner of the substructure of the pierhead, and consisted of an opening 12 feet in length, 10 feet in height, and extended some 6 feet into the pier work. It required 256 cubic feet of concrete to refill the area of the pocket of the crib. The opening in the timber wall of the substructure was closed up with timber and sheet piling was placed on its face. Since the pier running shoreward from the tower was entirely destroyed it has exposed the foundation of the beacon to the lake action on all sides. Hence it was necessary to have the pockets of the crib filled with concrete to prevent a recurrence of the washing out of the ballast. Some 1,056 cubic feet of block stone at the southeast corner of the pierhead, which had unevenly settled, were taken up and relaid in cement and the exposed faces of the block stone foundation were repointed. It is proposed to replace 900 feet of elevated walk connecting the beacon with the shore.

1091. *Erie, outside of Erie Harbor, Presqu'ile Bay, Lake Erie, Pennsylvania.*—A stoop 24 feet long, 6 feet in width, and resting on stone piers was built across the entire west front of the keeper's dwelling. Some 143 feet of 3-foot walk were laid with new material.

1092. *Presqu'ile Pierhead, Erie Harbor, Lake Erie, Pennsylvania.*—As the north pier, upon which the light now stands, will be extended 450 feet during this fall, the beacon must also be moved for that distance and the elevated walk must be extended to the beacon. The decayed bed timbers of the beacon will be replaced.

The following recommendation, which was made in the Board's last annual report, is renewed:

A bell is used as a fog signal at this light-station. It is ineffective. It is therefore suggested that it be replaced by a steam fog signal, at a cost not to exceed \$4,300, and it is recommended that an appropriation of this amount be made therefor.

1095. *Presqu'ile, north shore of the peninsula, Erie Harbor, Pennsylvania.*—Since the jetty, which extends 400 feet into the lake, was built, in 1886, the beach has formed to the westward for a length of 290 feet, measured along the axis of the pier. The beach has also formed 225 feet on the east side of the jetty. During the past fiscal year the beach has made 25 feet on the west side, and 38 feet on the east side, in the vicinity of the jetty.

1096. *Conneaut, entrance to Conneaut Harbor, Lake Erie, Ohio.*—Some 95 lineal feet of 2-foot walk in the rear of the dwelling was relaid with new plank, and 100 feet of 3-inch drain tile was laid around the dwelling for surface drainage.

1097. *Ashtabula, entrance to Ashtabula Harbor, Lake Erie, Ohio.*—Congress, by the act approved on March 3, 1891, appropriated \$4,700 for

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establishing here range lights and a steam fog signal. A contract was made on June 29, 1891, to furnish, deliver, and erect on the west pier a triangular skeleton tower, fitted with the necessary ball-bearing wheels for the lens hoisting apparatus, and one of the corner legs of the tower is to be supplied with steps to enable the keeper to ascend when necessary. It is proposed as a harbor improvement project to rebuild the outer portion of the east pier, to widen the channel. Hence no steps have yet been taken towards establishing the fog signal, as it is proposed to locate it upon this pier that the signal may be protected from the prevailing storms. The damage done on August 10, 1890, by the schooner *Annie Sherwood*, of Chicago, Ill., to the elevated walk on the west pier, was repaired at the expense of the owners of the vessel. Various repairs were made.

1099. *Fairport, mouth of Grand River, Lake Erie, Ohio.*—A plank walk, 4 feet wide and 235 feet long, was laid in front of the south line of the light-house site.

1101. *Fairport Pierhead, mouth of Grand River, Lake Erie, Ohio.*—On account of the extension of the east pier 150 feet lakeward, it will be necessary to move the beacon to the outer end of the pier and to extend the walk to the beacon.

Congress, by act approved March 3, 1891, appropriated \$400 for establishing range lights at this station. A contract was made on June 29, 1891, for furnishing, delivering, and erecting this fall, on the east pier, near the shore end, a 65-foot Star iron tower.

The following recommendation, which was made in the last annual report, is renewed:

The pier being extended lakeward for 80 feet, it is proposed, when practicable, to move the beacon near to the outer end of the newly made pier and to prolong the walk to the beacon. A bell is used as a fog signal at this light-station. It is inefficient. It is recommended, therefore, that it be replaced by a steam fog signal, at a cost not to exceed \$4,300, and that an appropriation of that amount be obtained therefor.

1102. *Cleveland, at Cleveland, Lake Erie, Ohio.*—The grade of the lawn, which measures 18 feet by 122 feet, in front of the light-house site, was lowered 10 inches, so as to be on a level with the stone walk, and the surplus soil was put on the lot adjoining the light-house. The lawn around the dwelling was sown with grass seed, and various repairs were made.

1103. *Cleveland East Pier, entrance to Cleveland Harbor, Lake Erie, Ohio.*—A boathouse 18 feet long, 9 feet wide, and 7 feet high in front, and 9 feet high in the rear, was built in front of the beacon, projecting 4 feet over the pier on the lake face, to shelter the keeper's boat, used to communicate with the west pierhead light. The interior of the boathouse was fitted with trap doors, covering the opening on the underside

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of the portion of the boathouse lapping over the pier, and rope and blocks for raising and lowering the boat were supplied.

1104. *Cleveland West Pier, entrance to Cleveland Harbor, Lake Erie, Ohio.*—A tight board fence, 10 feet high, was built across the pier 8 feet shoreward from the beacon, to exclude trespassers, etc.

— *Cleveland Breakwater (east end), west side of entrance to Cleveland Harbor, Ohio.*—The light was provided with a spare red tubular lantern. This light is shown from a mast 25 feet high, on the west end of the east breakwater whenever the weather is such that it can be reached.

1105. *Cleveland West Breakwater (east end of West Breakwater), entrance to Cleveland Harbor, Ohio.*—Congress, by act approved on March 2, 1889, appropriated \$5,200 to establish a steam fog signal here to replace the fog bell. The work of erecting the signal was deferred until the summer of 1890, so as to allow the crib to be properly protected against the lake action, which caused the crib to vibrate. Contract was made in July, 1890, for furnishing, delivering, and erecting on site, the boiler, machinery, etc., for a single steam fog whistle. Contract was also made for furnishing the material of all kinds necessary for the erection of the house for the signal; and the material was placed by hired labor. The fog-whistle machinery is a 30-horse power locomotive boiler, having a vertical engine, with 4-inch bore and a 9-inch stroke.

In front of the south face of the structure is a platform 25 feet by 28 feet in plan, which was built over the area between the light-house crib and the pile protection, for landing and storing fuel. A pair of davits, fitted with proper tackle, was secured to the outer end of the platform for raising and lowering material for the signal. Direct communication is had with the tower from the signal house.

1106. *Black River, entrance to Black River or Lorain Harbor, Lake Erie, Ohio.*—On account of the pierhead (supporting beacon) having lost part of its ballast, and to guard against severe gales, the beacon and foundation timbers were additionally secured to the pier work to withstand the vibration.

• The damage done to the elevated walk on July 1, 1890, by the schooner *B. F. Bruce*, was repaired at the cost of the owner of the schooner.

The slight damage done to the elevated walk on July 24, 1890, by *Iron Boat No. 102*, was also repaired at the cost of the owner of the boat.

Congress, by act approved March 3, 1891, appropriated \$400 for establishing range lights at this harbor. A contract was made on June 29, 1891, for furnishing, delivering, and erecting near the shore end of the pier a 65-foot Star iron tower this coming fall.

1111. *Cedar Point Range Beacon, entrance to Sandusky Bay, Lake Erie, Ohio.*—The superstructure of the crib, surrounding the interior founda-

Tenth District.

tion supporting the range dwelling is decayed so that the crib has separated in the center, causing the frame building, which rests in the center, to settle unevenly, and the crib work and structure are liable to be further damaged at almost any time by the lake action. It was proposed to place a triangular iron tower, 30 feet high, in the center of the crib, resting on a pile foundation projecting four feet above ordinary water level, and a contract was made on June 29, 1891, for furnishing, delivering, and erecting a stanchion tower, but since then it was found that the crib protection to the foundation proper had separated on the lake face. In order to save and protect the expensive crib work from further separation, as well as the foundation proper, it was decided to drive a row of piles around the entire outside of the crib work, and secure the piles with double walling to prevent further canting over, and to build the superstructure of the cribs back to full height, rather than to abandon the structure, and to substitute an iron tower, resting upon a pile foundation. The iron tower which was contracted for this range can be transferred and used elsewhere. Some repairs were made.

1115. *Marblehead, on northeast end of Marblehead, Lake Erie, Ohio.*—The metalwork for a circular oil house, which was procured by contract, was taken by the tender from Cleveland, Ohio, and delivered at the station, together with the cement for the foundation and brick lining. The metalwork was put together at the station and placed upon a concrete foundation, prepared upon a rock surface, and it was lined with brick. The oil house was located in the rear of the tower and between it and the dwelling.

—. *South Bass Island, Lake Erie, Ohio.*—The following recommendation which was made in the Board's last annual report is renewed:

This passage is much used in place of the north passage by vessels bound to and from Sandusky and Marblehead, or to Toledo from the east, and during heavy blows from the northwest. There are several dangerous shoals in it, which are only marked for daylight passage, and such passages are not always practicable; hence night passages are becoming necessary. It is therefore recommended that a light be established on the southerly end of South Bass Island, to range with Green Island light and Marblehead light, at an expense not to exceed \$8,600, and that an appropriation of that amount be made therefor.

1117. *West Sister Island, Lake Erie, Ohio.*—The metalwork for a circular oil house of 225 gallons' capacity, which was furnished by contract, was transported to the site by the light-house tender, which also delivered the material for its concrete foundation and brick lining. The metalwork was erected and placed upon a prepared concrete foundation on the rock surface. A brick lining was built inside of the iron shell. The boathouse was moved back from the lake front some 20 feet, and the boatways were extended to it.

—. *Port Clinton, Portage River, Lake Erie, Ohio (discontinued).*—A custodian is in charge of the premises, who keeps the dwelling in repair without expense to the United States.

Tenth District.

1126, 1127. *Maumee Inner Range Beacons, east bank of Maumee River, Ohio.*—Some 60 feet of walk, 3 feet wide, were laid from the kitchen to the street front; 10 feet of new walk, 6 feet wide, were laid in front of the light-house grounds, and 40 feet of walk, not continuous, leading to the front range, were repaired.

— *Grassy Point Range Lights, Straight Channel, Maumee Bay, Lake Erie, Ohio.*—This channel when completed, will be about 8 miles long. The axis of the improved channel is the line marked by the main range crib light and the east range crib light now established in Maumee Bay. These ranges will serve to mark a part of the new channel, but additional ranges are needed to mark the inner end of the channel. The portion of the new channel inside the location of the crib ranges is practically completed so far as excavation is concerned, and it was regularly buoyed out last spring so that it is now used by vessels. The rest of the new channel will be excavated this fall. That portion of the old channel marked by the middle and outer range lights is now but little used by vessels entering the harbor of Toledo. It is therefore recommended that range lights be established to light the straight channel in Maumee Bay, to be located near the mouth of Maumee River on the shore near Grassy Point, and to consist of a front range in shallow water built of iron on a pile foundation, and of a rear range; also, to be built of iron, to be located on the land on a lot sufficiently large to afford a site for the keeper's dwelling and other needful buildings. It is estimated that these will cost \$8,000, and it is recommended that an appropriation of this amount be made for that purpose.

— *Stony Point, Lake Erie, Michigan.*—The site was reserved by the United States for light-house purposes, but no light has been established there.

1128. *Monroe, entrance to River Raisin, Lake Erie, Michigan.*—The material and labor required for continuing 90 feet shoreward the parapet and pile protection to the pierhead and dwelling on the channel face of the north pier, and renewing the decking of the front of the north face of the dwelling, were furnished by contract. Various repairs were made.

— *Gibraltar, Detroit River, Michigan (discontinued).*—A custodian, at a nominal salary, is in charge of the premises. Various repairs were made.

1130. *Mamajuda, on Mamajuda Shoal, Detroit River, Michigan.*—The metalwork for a circular oil house which was obtained under contract was delivered to the tender at Cleveland, Ohio, which transported it to the station, together with the necessary cement for foundation and brick lining. The oil house will soon be erected near the southeast corner of the island and about on line with the east face of the Mamajuda light-keeper's dwelling. Various repairs were made.

Tenth District.

— *Mamajuda and Grassy Island Fisheries, Detroit River, Michigan.*—Some \$400 were collected and deposited to the credit of the United States, being a year's rental in advance for these shoals, under lease dated January 29, 1889.

1131, 1132. *Grosse Isle Range Lights, between Fighting Island and Lime Kiln Crossing, Detroit River, Michigan.*—Contract was made for furnishing all the materials and labor necessary for the construction of the two timber foundations to receive the equilateral triangular towers. Contract was also made for furnishing two skeleton towers, one 107 feet and the other 77 feet in height. The towers are composed of columns, sockets, struts, and tension rods framed in the form of a triangular pyramid. Each tower has a triangular foundation plate which is bolted to the timber foundation. The top section of the side facing the channels, for which the towers are the guide, are provided with horizontal slats and an oblong gridiron 12 by 15 feet in plan, to increase the visibility of the ranges by day. The light, a five-day lens lantern, which runs up and down the ladder in the plane of the structure, is housed by day, and at night is hoisted to its place at the apex of the triangle by machinery and counterpoise weight, worked in a small cubby house. The lights are 1,493 feet apart, and mark the range line for running the main channel of the Detroit River from Lime Kiln Crossing to a point southerly of Mamajuda light. The front light is 71 feet above mean low water and the rear light is 103 feet. The keeper's dwelling is located on Mamajuda Island. Minor alterations and improvements were made to the dwelling and a supply of water was obtained from the river. The store of the seine house at the southwest corner of the island, which was converted into a boathouse for Mamajuda station, was arranged to accommodate the keeper's boat for the ranges; walks were laid around the dwelling and leading to the boathouse. A circular iron oil house, of 360 gallons' capacity, was delivered on Mamajuda Island by the tender, and will soon be erected. The oil house is intended for the use of both Grosse Isle range and Mamajuda light-station. The vessel men say that the ranges well serve the purpose for which they were intended.

1133. *Grassy Island, on Grassy Island Shoal, Detroit River, Michigan.*—Twelve shade trees were planted around the dwelling. A contract was made on June 25, 1891, for furnishing the material and labor required for strengthening the face of the east and west sides of the north end of the cofferdam. Various repairs were made.

Tenth District.**REPAIRS.**

At each of the following-named stations repairs, more or less extensive, were made during the year:

1061. Cross-Over Island, N. Y.	1116. Green Island, Ohio.
1067. Sacketts Harbor, N. Y.	1118. Turtle Island, Ohio.
1069. Stony Point, N. Y.	1122, 1123. Maumee Outer range beacons, Ohio.
1080. Oak Orchard, N. Y.	1124, 1125. Maumee Middle range beacons, Ohio..
1089. Dunkirk, N. Y.	1129. Detroit River, Mich.
1108. Vermillion, Ohio.	
1109. Huron, Ohio.	
1110. Cedar Point, Ohio.	
1113, 1114. Sandusky Bay range beacons, Ohio.	

FOG SIGNALS.

1105. *Cleveland Breakwater, Lake Erie, Ohio.*—This 10-inch steam fog whistle is in good condition. Since this signal was established on October 30, 1890, it has been in use 210 hours, with an expenditure of about 16 tons of bituminous coal.

1129. *Detroit River (Bar Point), Lake Erie, Michigan.*—This 10-inch steam fog whistle is in good condition with the exception of one of the smokestacks of the duplicate signal, which was so corroded that it broke in the middle. A new one has been ordered. This signal was in use about 162 hours, with an expenditure of about 14 tons of anthracite coal.

The clockwork apparatus, operating five bells in this district, is in good condition and is doing well.

BUOYAGE.

The buoyage of the district is in a satisfactory condition. The tender *Haze* has cared for the buoys in Lake Erie, Detroit River, and Niagara River. The buoy formerly marking the spit at the northern end of Tonawanda Island was discontinued. A buoy was placed upon the Waverly Shoal, off the entrance to Buffalo Harbor. The spare buoys and their appendages are most of them in good shape. During the winter, forty new spar buoys were made while the tender was laid up. All are conveniently distributed. The buoy houses are in good repair.

DEPOTS.

Rock Island, New York.—No repairs were made and none were reported as necessary.

Buffalo, New York.—No repairs were made and none were reported as necessary.

Erie, Pennsylvania.—The decayed timbers supporting the floor of the buoy house were replaced by new ones, and the platform in front of the buoy house was entirely renewed.

Tenth District.

Cedar Point, Ohio.—No repairs were made and none were reported as necessary.

Maumee Bay, Ohio.—No repairs were made and none were reported as necessary.

The buoy houses are in fairly good repair.

THE SLIP FOR THE TENDER.

Buffalo, New York.—The unfinished work on July 1, 1890, which was deferred for want of sufficient funds at that time to complete the work of placing an additional row of sheathing plank around the entire inside of the slip to prevent the filling, back of the piling, from forcing itself through between the joints of the sheathing plank and depositing itself in the area of the slip, was resumed and completed. The space between the double sheathing of the pile revetment was filled with cinders so as to prevent leakage of sand, and the back filling from draining into the slip and causing constant dredging, and endangering the keeper's dwelling adjacent to the slip. The slip was dredged so as have $11\frac{1}{2}$ to 12 feet of water. Part of the dredged material was deposited back of the pile sheathing, under the platform surrounding the slip. The river front of the reservation, extending 25 feet into the channel along the front of the dock between the runway of the U. S. Life-Saving Station and the first corner of the slip, was dredged until 11 feet of water were obtained. It will be necessary to dredge annually in front of the reservation, as well as in the slip, for the reason that the large steamers loading coal in the vicinity of the slip plow up the dirt with their wheels when backing up to the coal docks.

TENDER.

The Haze.—This steamer is in good condition. Her engine and boiler were repaired while she was laid up in the winter. Although the boiler shows signs of deterioration, it is still serviceable. It was examined in the spring of 1891 by the Government inspector of boilers at Detroit. The tender was usefully employed during the season of navigation in caring for the buoyage of Lake Erie and the Detroit River, in placing the buoys in Niagara River, and on inspection trips, as well as for supplying light-stations. She also carried five of the new iron oil houses to their stations from Cleveland, Ohio, one each to West Sister Island, Marblehead, and Mamajuda light-stations in Lake Erie, and to Big Sodus and Thirty-Mile Point light-stations, in Lake Ontario. She was laid up at Detroit, Mich., on December 10, 1890, when all her crew were discharged, except the officers, cooper, steward, cook, and one fireman. She left Detroit on April 9, 1891, on the buoy trip and, after completing that work, began on May 25, 1891, to supply light-stations, finishing that duty on June 21, 1891. During the year she ran 8,342 miles, consuming in so doing about 300 tons of coal.



J. H. DIS

June 30, 1891

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ELEVENTH DISTRICT.

This district extends from Grassy Island light-station, Detroit River, to the head of Lake Superior, and covers the American shores and waters of the Detroit and St. Clair Rivers; Lakes St. Clair, Huron, and Superior; St. Marys River, and the portion of the Straits of Mackinac eastward of a line from Old Mackinac Point.

Inspector.—Commander Oscar F. Heyerman, U. S. Navy.

Engineer.—Maj. William Ludlow, Corps of Engineers, U. S. Army.

Three are in the district—

Light-houses and beacon lights	96
Light-ship in position	1
Day or unlighted beacons	1
Fog signals operated by steam	18
Fog signals operated by clockwork	4
Bell buoys in position	2
Other buoys in position	152
Steam barge <i>Warrington</i> , buoy tender, and for supply and inspection	1
Steam launch <i>Lotus</i> , for construction and repair	1
Steamer <i>Marigold</i> , buoy tender and for supply and inspection	1

LIGHT-HOUSES.

1134. *Belle Isle, Detroit River, Michigan*.—A circular iron oil house of 225 gallons' capacity was erected, and various repairs were made.

1135, 1136. *Windmill Point Range, head of Detroit River, Michigan*.—The act of March 3, 1891, appropriated \$3,000 for the establishment of range lights at this point. Work was begun April 8 and completed in May, 1891. It was done by contract. On the night of May 20, 1891, the lights were exhibited for the first time.

1137. *Windmill Point, Detroit River, entrance to Lake St. Clair, Michigan*.—This light was changed on December 7, 1890, from a fifth-order fixed white varied by a red flash every ninety seconds to a fourth-order fixed white varied by a red flash every fifteen seconds.

1138. *Grosse Pointe Beacon, Lake St. Clair, Michigan*.—The passage across the Grosse Pointe Flats is now marked by a light-ship at the north end and a pile-cluster beacon at the head of the Detroit River, both on the east side of the channel. The beacon was damaged by ice during the winter. It will be repaired during the coming season.

1142. *St. Clair Flats Canal, lower, Lake St. Clair, Michigan*.—A circular iron oil house, of 225 gallons' capacity, was built, and various repairs were made.

1143. *St. Clair Flats Canal, upper, Lake St. Clair, Michigan*.—A circular iron oil house, of 225 gallons' capacity, was built and various repairs were made.

Eleventh District.

1144-1155. *St. Clair River Lights, Michigan.*—This system of 12 lights, ranging the reaches and marking the turning-points in the river, from above the canal to above Russell Island, has proved satisfactory, and the number of collisions and accidents, in that narrow and tortuous navigation, has been greatly reduced.

1156. *Fort Gratiot, head of St. Clair River, Michigan.*—A circular iron oil house, of 360 gallons' capacity, was built. New walks were laid from the dwelling to the oil house and from the gate to the street, and various repairs were made.

1157. *Fort Gratiot Range, head of St. Clair River, Lake Huron, Michigan.*—The following recommendation was made in the last annual report:

Two ranges are now maintained at Fort Gratiot at private cost. One set consists of two electric lights to guide through the entrance into the St. Clair River. The other consists of two towers and lights on the Canadian side, intersecting with the former range about four-fifths of a mile from shore and guiding past and to westward of the outlying shoals at the lower end of Lake Huron. These ranges appear to be well located. The American range should be maintained and controlled by the Light-House Establishment. It is therefore recommended that an appropriation of \$500 be made for this purpose.

The appropriation was made pursuant to this recommendation, and the lights passed into the care of the Light-House Establishment, which has kept them during the season.

1163. *Pointe aux Barques, Lake Huron, Michigan.*—A new frame woodshed was built. Various minor repairs were made.

1165. *Saginaw River frontrange, Michigan.*—A gasoline light was introduced and the color of the tower was changed from white to red.

1166. *Saginaw River rear range, Michigan.*—On the night of June 15, 1891, this light was changed from a fixed white to a fixed red.

1168. *Tawas (Ottawa), Saginaw Bay, Michigan.*—A new illuminating apparatus was ordered, raising the light to the fourth order and reducing the flashing period from ninety to thirty seconds. The apparatus has been delivered at the light-house depot in Detroit. The change will be made at an early date. Various repairs were made.

1171. *Alpena, entrance to Thunder Bay River, Michigan.*—A fog bell was established at this station, and on March 20, 1891, was sounded for the first time.

1172. *Thunder Bay Island, Lake Huron, Michigan.*—A working party was landed on September 20, and made general repairs to the keeper's dwelling and rebuilt part of the tramway, which was washed away during the fall of 1889. The fog signal was put in order. The water-supply well for the fog signals was deepened and enlarged.

1175. *Presque Isle, Lake Huron, Michigan.*—With the appropriation of \$5,500 made by the act approved March 2, 1889, the fog signal at this station was put up.

Eleventh District.

1176. *Spectacle Reef, Lake Huron, Michigan.*—The foundation crib, which was damaged considerably by the ice during the open winter, will be repaired during the current season. Some repairs were made.

1178. *Bois Blanc, Lake Huron, Michigan.*—A landing was built. The boathouse was moved nearer the beach and the boatways were rebuilt. A brick cistern was built in the cellar and the conductor pipes of the dwelling were extended to it. A drive well was put down near the beach to the eastward of the tower, and a force pump and rubber hose were provided for domestic purposes and for protection from fire. A plank walk was laid from the front and back doors of the dwelling to the drive well. Various repairs were made.

— *Forty-Mile Point, Lake Huron, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

This point is understood to mean Hammond Bay, which is 40 miles to the eastward of McGulpin Point light-house. Cheboygan and Presque Isle light-houses are about 50 miles apart, with no aid to navigation between them. Considering the magnitude and value of the commerce of this vicinity the distance unmarked by a light is far too great. A light-station is needed about midway between the two. It should have not only a fog signal, but also an efficient coast light. The proper location for this is on the prominence of the coast eastward of Hammond Bay, about equidistant between Cheboygan and Presque Isle. The cost of the station complete would be about \$25,000. It is recommended, therefore, that a light and fog-signal station be established about midway between Cheboygan and Presque Isle light-stations at such point as the Board may fix upon on further examination, and that an appropriation of \$25,000 be made therefor.

1181. *Cheboygan River, front range, Straits of Mackinac, Michigan.*—A sidewalk was laid in front of the keeper's dwelling. The work of moving the front range light and the keeper's dwelling to the new site was begun in the latter part of June, 1891. The following recommendation, made in the Board's last annual report, is renewed:

The sanitary condition of this station is bad. The light-house lot is narrow and its entire front is occupied by the light-house buildings. The cellar is often inundated and there is no drainage nor means of any except to the river over private land. It is now proposed to extend the light-house lot back to the river by purchase at an estimated expense of \$1,750. Recommendation is therefore made that an appropriation of this amount be made for this purpose.

1184. *Pipe Island, Detour Passage, Michigan.*—A small circular iron oil house and 1,200 bricks were delivered at the station by the light-house tender *Warrington*.

— *North Passage, Mission Point, Mackinac Island, Lake Huron, Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

Mission Point is understood to be on the eastern extremity of Mackinac Island, in which position a light would serve only as a general guide and be of little service for the passage of the narrow strait between Mackinac and Round Islands. What is needed is a light so placed as to enable vessels to hold a close and safe course be-

Eleventh District.

tween the two, for which reason the light should be either on the spit at the western side of the harbor of Mackinac Island or on the projecting point of Round Island, directly opposite. At present there are no lights to aid the navigation of the northern channel, for which reason vessels are compelled to use the southern, with considerable loss of distance and time. The Government owns Round Island, and a light-house site there would cost nothing. On Mackinac Island the land is held at a high valuation, particularly in the vicinity of the town, which is a noted summer resort, and it would be both difficult and costly to obtain a site there. It is therefore recommended that an appropriation of \$15,000 be made for building a light and fog-signal station, not at Mackinac Island, but on Round Island.

— *St. Marys River, from Pipe Island to Sault Ste. Marie, Michigan.*—The act approved March 3, 1891, appropriated \$30,000 for the construction of a system of lights and ranges from Pipe Island to the Sault. In view of the delay in procuring the lenses from abroad tubular lanterns made in this country were used for the time being, but they will be replaced with more powerful illuminants if necessary. An examination of the river was made in the latter part of May, 1891, and another about the middle of June. The lights will be established, so far as practicable, during this season.

1189, 1190. *St. Marys River Upper Range (front and rear), Michigan.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The conditions in the vicinity of Round Island and Point Iroquois, St. Marys River, are unsatisfactory to navigators of these waters. Owing to the insufficient depth and the narrowness of the passage, which is but a quarter of a mile wide between the 11-foot shoals bordering the channel on the St. Marys River upper range, the greater number of vessels prefer to hold the lower range until they can change course in deep water westward of the shoals. In fact, the channel through the St. Marys River upper range was barely navigable until a cut had been dredged, which is now partly filled up, and with any sea a deep vessel can not use it. In addition to these obstructions, there are several others near to the 6-fathom contour between Round Island and Iroquois Point, which are brought out by drawing the 18-foot contour. The largest has but 14 feet on it. These are now insufficiently marked by buoys. An effective guide past all these is needed. The Board suggests that it be furnished by laying out a new range on shore. This can be done most economically by abandoning the present upper range and moving the buildings to the new line, after which the St. Marys River lower range should be shifted slightly to the southward to clear the 10-foot lump now marked by the red can buoy. The cost of doing this would be about \$2,000. The Board recommends that an appropriation of that amount be made therefor.

1191. *Point Iroquois, Lake Superior, Michigan.*—The fog-signal house and duplicate machinery were built. The signal was sounded for the first time on October 31, 1890. General repairs were made to the keeper's dwelling.

1192. *White Fish Point, Lake Superior, Michigan.*—The characteristic of the station will be changed from fixed white to fixed white varied by red flashes with twenty-seconds' periods.

Eleventh District.

1196, 1197. *Grand Island Harbor Range, Lake Superior, Michigan.*—A hoisting winch was purchased for use in connection with the delivery of supplies. Various repairs were made.

1198. *Marquette, Lake Superior, Michigan.*—The sea wall, for the protection of the fog-signal houses, was thoroughly repaired. A house for the water pipes was built on the water-supply crib. A new plank walk was laid from the dwelling to the lake shore. Various repairs were made.

1199. *Marquette Breakwater, Lake Superior, Michigan.*—The metal-work for the new light-house was completed by contract in October and its erection was completed on November 8, 1890.

1200. *Granite Island, Lake Superior, Michigan.*—A landing derrick to facilitate the delivery of supplies, was put up. The timber was framed at the light-house depot in Detroit. Slight repairs were made.

1201. *Huron Island, Lake Superior, Michigan.*—The work of rebuilding the water supply for the fog signal was completed in July, 1890. The north corner of the dwelling, which was struck by lightning on the afternoon of June 27, 1890, was repaired. Various repairs were made.

1212. *Eagle Harbor, Lake Superior, Michigan.*—The following recommendation, made in the Board's last annual report, is renewed:

A steam fog signal would be a valuable addition to the light-station at this point. It can be established for \$5,500, and the Board recommends that an appropriation of that amount be made therefor.

1222. *La Pointe, Lake Superior, Wisconsin.*—The building of this steam fog signal was begun early in October and completed in January, 1891. The signal stands about three-fourths of a mile eastward of the light.

— *Chequamegon light and fog signal, Lake Superior, Wisconsin.*—The following recommendation, which was made in the Board's last annual report, is renewed:

A light on the east side of the entrance to Chequamegon Bay has been in service since 1858, and the act of October 1, 1888, authorized a fog signal at a cost of \$5,500, and on March 2, 1889, an appropriation was made therefor. This additional aid is much needed. In order, however, to fully meet the requirements of the situation, further improvements are needed. The present light is not near enough to the inner point to serve as a good guide to clear it, and it is too far from the course of vessels outside to be of the best advantage. The fog signal should be on the outer beach, about 1 mile east of the present light, and if so established the light also should be moved to the same location. To mark the inner point towards Houghton a small harbor light and fog bell struck by machinery will meet all requirements.

The expenditures necessary are estimated as follows:
For removing and rebuilding the main light..... \$7, 500
For the harbor light and bell..... 2, 500

Total estimated cost 10, 000
The Board recommends that an appropriation of \$10,000 be made therefor.

Eleventh District.

— *Bayfield, Lake Superior, Wisconsin.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The increasing commerce of the place and the fact that this is one of the best and largest harbors of Lake Superior, make it evident that a light should be established here. It is estimated that this can be done for a sum not exceeding \$5,000, and recommendation is made that an appropriation of this amount be made therefor.*

1224. *Devils Island, Apostle Group, Lake Superior, Wisconsin.*—The act approved March 2, 1889, appropriated \$15,000 for building a light-station, and the act approved March 3, 1890, appropriated \$5,500 for establishing a fog signal to complete the station to be erected on Devils Island. The appropriation for the light was insufficient. Devils Island is an isolated station with no adequate harbor. The light, which is to be flashing and of the third order, will become one of the most important turning-points in Lake Superior. In addition it is to have a fog signal, and provision must be made, therefore, for not less than three keepers. The station, exclusive of the fog signal, is estimated to cost \$35,000, leaving an additional appropriation of not less than \$22,000 to be made after paying for the land and other contingent expenses. In view of the improbability of securing the additional amount needed at the current session of Congress it was decided that, pending action in this regard, a temporary skeleton-frame tower should be built to prevent further delay in exhibiting the light and, while awaiting the arrival from France of the third-order flashing lens required, to exhibit a fixed red light of the fourth order. The building of the duplicate fog-signal boilers and machinery was in progress under contract at the end of the year. An addition of \$22,000 is needed for furnishing the station with a permanent tower, and it is recommended that this amount be appropriated for that purpose.*

— *Superior Bay, Lake Superior, Wisconsin.*—The following recommendation, which was made in the Board's last annual report, is renewed:

The channel in Superior Bay from the natural entrance to Connors Point should be so marked that vessels can get in or out after night without aid from tugs. It is claimed that over nine hundred vessels will have arrived and cleared from this port this year with a commerce exceeding \$28,000,000 in value. The largest line of steamers on the lakes makes its headquarters here. The Board is of opinion that this channel can be sufficiently marked by lights shown from lanterns, mounted on six clusters of piles, which will burn from five to eight days without trimming, if need be. These can be built for, say, \$200 each. The Board therefore recommends that an appropriation of \$1,200 be made therefor.

1229. *Two Harbors, Lake Superior, Minnesota.*—Negotiations for the purchase of this site had been carried on since 1886 without satisfactory

* A fixed red light of the fourth order was shown from a temporary structure at this station on the night of September 30, 1891, for the first time. The light is 87 feet above the lake level, and it can be seen in clear weather about 13 miles. The fog signal is a 10-inch steam whistle.

Eleventh District.

result, and in July, 1890, proceedings were instituted to condemn the land, pending which the owner deeded the site required to the United States. The deed and abstract of title, received through the governor of Minnesota from the owner, were forwarded on September 20, 1890, to the United States attorney for examination. Plans for a tower and a keeper's dwelling were made and proposals to do the work were received on June 22, in response to poster and circular-letter advertisement. The materials are to be delivered in July, when a working party will be provided. The work, it is expected, will be finished during this season.

1231. *Isle Royale, Lake Superior, Michigan.*—A boathouse and landing crib were built and boatways were provided. The materials were bought and the work was done by hired labor under the direction of the keeper. A 4-ton boat-hoisting winch was purchased.

The Patrol of the St. Marys River.—An appropriation of \$4,000 was made by the act approved on March 3, 1891, "for procuring a patrol steamer for use on the St. Marys River, Michigan," for the replacement of buoys, marking the channel lines in that river, displaced by rafts or otherwise during the season of navigation. The Board thereupon contracted for the doing of this work for the sum appropriated from May 1 to November 30, 1891, being for the season of navigation in that year and during May and June of 1892. It was with great difficulty that the Board was able to induce anyone to undertake the work for the sum named, and it was only by allowing the contractor to do it by any of several steamers instead of confining one steamer to the work that it was effected.

The patrol was begun on May 1, and it has proved to be a satisfactory means of keeping the buoys in place.

The work was so well done, and it effected so much in the interests of the navigation of this greatly crowded river, that the Board is constrained to repeat its recommendation of last year and to ask that \$4,000 be appropriated for procuring a patrol steamer for use on the St. Marys River during the coming year.

REPAIRS.

Repairs, more or less extensive, were made during the year at the following-named stations:

1141. St. Clair Flats Range (rear), Mich.	1202. Stannard Rock, Mich.
1159. Sand Beach (main), Mich.	1203. Sand Point, Mich.
1160. Sand Beach (S. light), Mich.	1208. Gull Rock, Mich.
1162. Sand Beach (W. light), Mich.	1213, 1214. Eagle Harbor Range, Mich.
1164. Port Austin Reef, Mich.	1215. Eagle River, Mich.
1167. Charity Island, Mich.	1218. Ontonagon, Mich.
1170. Sturgeon Point, Mich.	1220. Outer Island, Wis.
1177. Detour, Mich.	1227. Duluth Range (front), Minn.
1183. Frying-pan Island, Mich.	1230. Grand Marais, Minn.

Eleventh District.**GENERAL SERVICE.**

A Roberts boiler has been built for test and comparison with the existing fog-signal boilers. Necessary tools and pipe fittings, for the erection and repair of steam fog signals in the ninth and eleventh light-house districts, and a quantity of black pipe, bolts, nuts, rods, washers, 270 feet of boiler tubes, and 30 sets of grate bars were bought and delivered at the light-house depot, Detroit. Twelve 10-inch fog whistles were ordered for general use in connection with the fog-signal apparatus. The tools and materials needed for repairs and improvements at stations in the ninth and eleventh light-house districts were delivered at the light-house depot in the latter part of June, 1891.

OIL HOUSES.

A contract was made, for the metalwork required for five circular iron oil houses. It was inspected and delivered on April 30 at the light-house depot, Detroit. The material needed for building six circular iron oil houses was bought and delivered at the light-house depot. There are numerous stations in the eleventh light-house district at which independent fireproof oil houses are needed, but the appropriation made for the purpose admits of but slow progress in furnishing them.

LIGHT-SHIP.

139. *Grosse Pointe Light-Vessel, No. 10, Lake St. Clair, Michigan.*—This vessel is the only one in the district. She has not been docked or repaired for several years, and though she is in sufficiently good condition to last out this season, she needs to be docked and extensively overhauled at the close of navigation.

DAY OR UNLIGHTED BEACON.

There is but one in this district. That is near Stannard Rock, in Lake Superior. It is in good condition.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

156. *Fort Gratiot, Michigan.*—This 8-inch steam whistle was in operation 129 hours, consuming about 12 short tons of coal.

159. *Sand Beach (harbor of refuge), north main light, Michigan.*—This 10-inch steam whistle was in operation 169 hours, consuming about 16 short tons of coal.

164. *Port Austin Reef, Michigan.*—The first-class steam siren was in operation 55 hours, consuming about 9 short tons of coal.

172. *Thunder Bay Island, Michigan.*—This 10-inch steam whistle was in operation 218 hours, consuming about 18 short tons of coal.

Eleventh District.

1175. *Presque Isle, Michigan*.—This 10-inch steam whistle was in operation 155 hours, consuming about 12 short tons of coal.

1176. *Spectacle Reef, Michigan*.—This 10-inch steam whistle was in operation 202 hours, consuming about 7 short tons of coal.

The amount of drift wood picked up by the keepers at Spectacle Reef and used as fuel renders the consumption of coal, per hour of fog, much less than at any other station.

1177. *Detour, Michigan*.—This 10-inch steam whistle was in operation 194 hours, consuming about 15 short tons of coal.

1179. *Cheboygan, Michigan*.—This 10-inch steam whistle was in operation 182 hours, consuming about 13 short tons of coal.

1191. *Point Iroquois, Michigan*.—This 10-inch steam whistle was in operation 73 hours, consuming about 6 short tons of coal.

1192. *White Fish Point, Michigan*.—The 10-inch steam whistle was in operation 443 hours, consuming about 25 short tons of coal.

1198. *Marquette, Michigan*.—This 10-inch steam whistle was in operation 357 hours, consuming about 21 short tons of coal.

1201. *Huron Island, Michigan*.—This 10-inch steam whistle was in operation 228 hours, consuming about 14 short tons of coal.

1202. *Stannard Rock, Michigan*.—The 10-inch steam whistle was in operation 340 hours, consuming about 19 short tons of coal.

1207. *Manitou, Michigan*.—This 10-inch steam whistle was in operation 513 hours, consuming about 34 short tons of coal.

1220. *Outer Island, Wisconsin*.—This 10-inch steam whistle was in operation 329 hours, consuming about 23 short tons of coal.

1227. *Duluth Range (front), Minnesota*.—This 10-inch steam whistle was in operation 421 hours, consuming about 25 short tons of coal.

1232. *Passage Island, Michigan*.—This 10-inch steam whistle was in operation 580 hours, consuming about 35 short tons of coal.

BUOYAGE.

There are now in the district 154 buoys in position, classified as follows:

Bell buoys.....	2
Iron can, first-class buoys	2
Iron can, second-class buoys.....	6
Iron can, third-class buoys.....	4
Iron nun, first-class buoys.....	1
Iron nun, second-class buoys	6
Cedar spars, second class	77
Cedar spars, third class	56

On the establishment of the Grosse Pointe beacon the second-class spar buoy, marking the 15-foot patch, 700 feet northwest of the light-vessel, was discontinued. The troublesome, and often dangerous, displacement of buoys in the St. Clair, Saginaw, and St. Marys Rivers, by

Eleventh District.

timber rafts, still continues, and to obviate this difficulty in the St. Marys River an appropriation of \$4,000 was made for the purpose of maintaining a patrol steamer, which should, as far as practicable, immediately replace any buoy found out of position. A contract was made to do this work, and on May 1 a steamer began the patrol of the river, and has proved to be a satisfactory means of keeping the buoys in place.

DEPOT.

Detroit, Michigan.—An examination was made of the wharf at the Detroit supply and buoy depot, and plans with estimates for repairs were prepared. Work was begun November 1, 1890, under a contract made in accordance with bids received therefor, and was finished December 10.

TENDERS.

The Marigold.—The new steamer *Marigold* was completed, and after two satisfactory trial trips was accepted. The results of the trial showed: Steam, 140; revolutions, 140; vacuum, 24½; and speed, 13 knots. The light-house inspector made two trips in her, one for the purpose of setting buoys and one for inspecting and supplying lights, and he found her suitable for her work and satisfactory as to speed and accommodations. Until the completion of the *Marigold* the steam-tender *Warrington* was under the inspector's orders, and both tenders were continuously and usefully employed in doing the work of the district.

The following is a synopsis of the work performed by the two vessels: Some 402 tons of coal and 18 cords of wood were delivered to fog-signal stations; the 96 lights in the district were furnished with 10,010 gallons of mineral oil, besides all the other articles of annual supply, including the rations and fuel allowed keepers of isolated stations; the lights were visited and inspected quarterly during the season of navigation, and 123 buoys were removed, repainted, and replaced; the number of miles steamed while doing this work was 11,058, the coal consumed 602 gross tons. The tender *Warrington*, on March 10, 1891, was turned over to the light-house engineer of the district for his temporary use.

The Warrington.—This steamer was temporarily transferred, on March 10, 1891, by the inspector to the engineer of the ninth and eleventh light-house districts. The hull of the tender was calked and painted. A new set of grate bars was provided for the boiler and the machinery was thoroughly overhauled. The tender was fitted out and put in service on April 1, 1891. It first made some local inspections and carried materials for the construction of Windmill Point range. The tender was employed during May and June in transporting the workmen and materials needed in building Devils Island light-station.

The Ruby.—This little steamer was chartered to serve as a tender in the ninth and eleventh light-house districts, and during July, August,

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September, and October, 1890, she was employed in carrying materials for construction and repair at St. Clair Flats Canal, upper and lower, Presque Isle, Old Mackinac Point, Spectacle Reef, Sand Beach, Thunder Bay Island, Granite Island, and La Pointe light-stations. On November 21, 1890, she went out of commission.

The Lotus.—A leaky boiler tube was replaced with a new one and slight repairs were made to the machinery of this steamer. The hull was repainted, a new flagstaff was erected, and the boiler was sent to a machine shop to be overhauled, and various repairs were made. A new propeller wheel and a new tiller rope were provided.

TWELFTH DISTRICT.

This district extends from the boundary line between California and Mexico to the boundary line between California and Oregon, a distance of about 800 miles of coast line, and embraces all the aids to navigation on the seacoast, bays, and navigable rivers of California.

Inspector.—Lieut. Commander Thomas Perry, U. S. Navy.

Engineer.—Maj. William H. Heuer, Corps of Engineers, U. S. Army.

There are in this district:

Light-houses and lighted beacons	36
Light-ship in position	1
Day or unlighted beacons	48
Fog signals operated by steam	14
Fog signals operated by clockwork	7
Whistling buoys in position	12
Bell buoys in position	5
Other buoys in position	83
Steamer <i>Madroño</i> , buoy tender, and for supply and inspection	1
Steam launch <i>Hazel</i>	1

LIGHT-HOUSES.

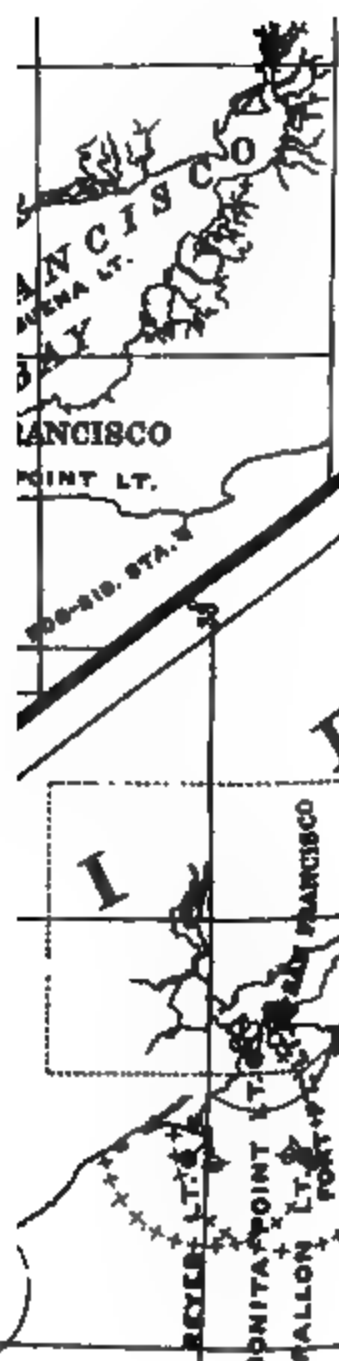
785. *Point Loma, entrance to San Diego Bay, California.*—This new station was completed by the end of the last fiscal year, except the iron tower and the lens. The tower was received at the site on July 16, and was erected during August. The lens furnished was found to be too large for the space provided for it, therefore it was necessary to procure another, which reached the station in January, 1891, and was put in place during February. On March 23, the light was exhibited for the first time. It is of the third order, flashing red and white alternately, with twenty seconds' interval between the flashes. An electrical call-bell system was put up connecting the tower with both dwellings.

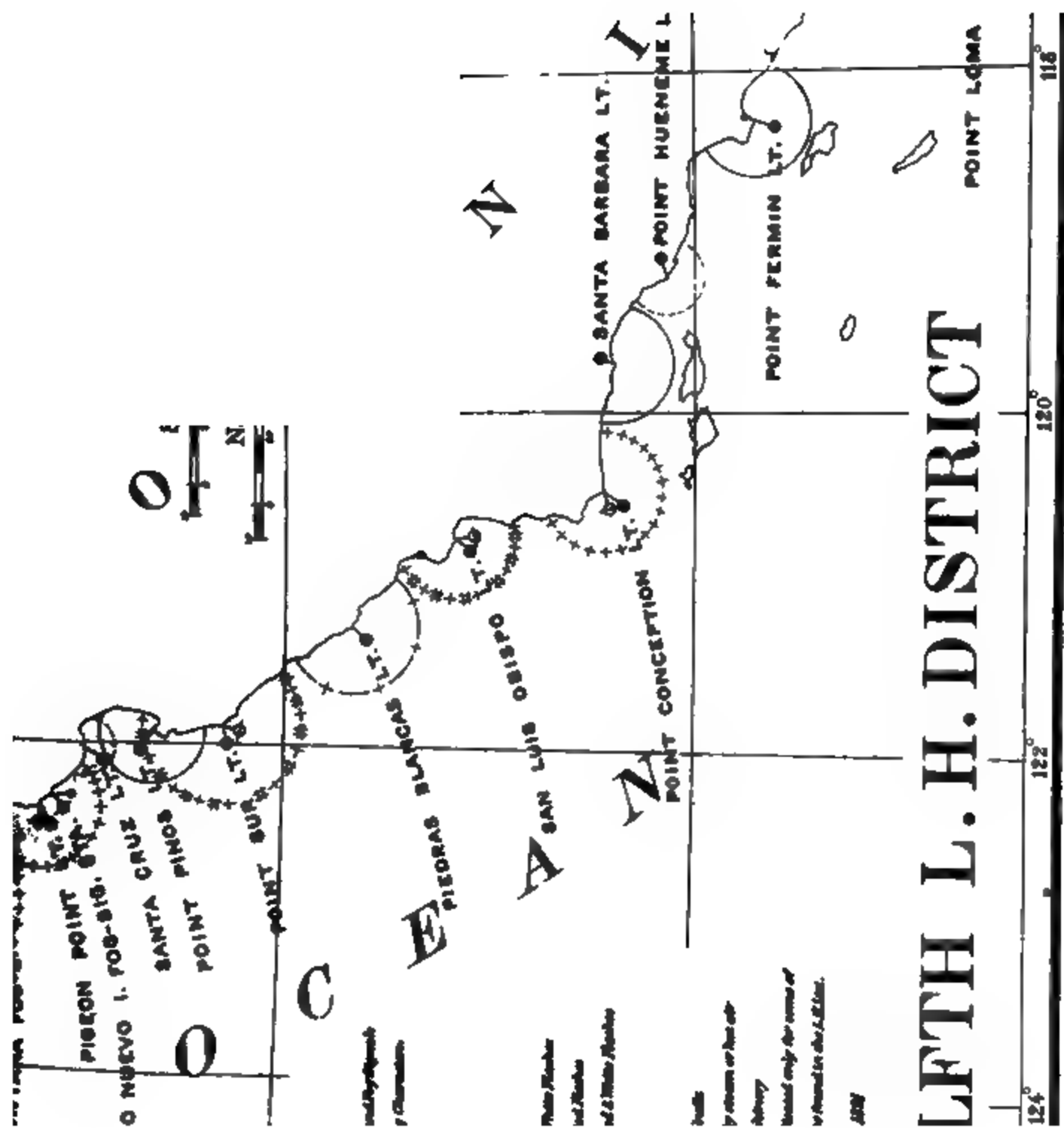
786. *Ballast Point, entrance to San Diego Bay, California.*—This station was completed by the end of the last fiscal year, but was not put in operation until August 5, 1890, on which date a fixed white light of the fifth order was exhibited. There is also a fog bell which will be struck by machinery every ten seconds during thick and foggy weather. Plank walks leading to the various buildings were laid.

— *Deadman Island, at the outer end of the jetty on the east side of the entrance to San Pedro Harbor, California.*—The following recommendation which was made in the Board's last two annual reports is renewed:

The port of San Pedro, or Wilmington, is the seaport for Los Angeles. An enormous quantity of coal, lumber, and general freight is brought into this little harbor, which was made by breakwaters constructed by the United States. Deeply laden schooners discharge inside the harbor, while deep-water ships discharge into lighters out in the bay. It is necessary to use the tides in getting into this harbor, as there

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are but 12 feet of water on the bar at low tide. Fogs prevail at all seasons, and it is difficult to find the entrance at night or in foggy weather. It is recommended, therefore, that a harbor light and fog bell, operated by clockwork, be established on Deadman Island, at the entrance to this harbor, at an estimated cost of \$5,000. This small island belongs to the Government, and is large enough for the purpose.

792. *Point Hueneme, entrance to the Santa Barbara Channel, California.*—The act approved August 30, 1890, appropriated \$250 for the purchase of the right of way from Point Hueneme light-station to the county road. As the original estimate for this was \$1,250, being \$1,000 for the purchase of the land and \$250 for incidental legal expenses. Congress by the appropriation made indicated its opinion that the price named for the land was exorbitant. Proceedings in condemnation for the site, therefore, will be commenced as soon as practicable.

— *Point Arguello, a prominent point about 12 miles northwest of Point Conception, seacoast of California.*—The following recommendation, which appeared in the Board's annual report for the last two years, is renewed:

This point is about 12 nautical miles to the northward and westward of Point Conception. It is reported to be one of the foggiest places on the Pacific coast. In consequence of the sharp bend in the coast, the outlying rocks, and the almost constant fog that prevails, Point Arguello is one of the most important points on the coast at which a light and fog-signal station should be established. It is estimated that this work can be done for \$35,000, as the United States already owns the site which is deemed most suitable for the buildings.

795. *San Luis Obispo, near Port Harford, seacoast of California.*—The pipe line to convey water from Pecho Creek to the station, commenced in the last fiscal year, was completed in August, and by it an ample supply of good water was obtained. During the winter the heavy rains brought down large quantities of earth and other débris, which clogged the dam and pipes. To remedy this the dam was cleaned out and some of the pipes taken up and cleared. To prevent a recurrence of this accident the reservoir was walled up with stone, and two intercepting dams were built on the stream above the main one. A gate was also put in the lower dam to allow the muddy water to escape during floods. A plan and estimate for a new wharf was made, the material for its construction was purchased, and it will be built early in the coming year.

— *Point Buchon, about 8 miles northwest from Point San Luis Obispo, California.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This point is in San Luis Obispo County, and is 17 miles distant from the town of San Luis Obispo by wagon road and trail. The nearest light-house is Piedras Blancas, about 30 nautical miles to the northward and westward. The point is prominent, and with its outlying rocks is very dangerous to navigators close inshore during a fog, especially as vessels going to and from Port Harford make a sharp turn just off this point. It is estimated that a light-house and fog signal can be erected at this point for \$33,000.

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797. *Point Sur, seacoast of California.*—Great trouble was experienced in keeping the rain from driving through the porous stone of which the dwelling walls are built. To prevent this, the Sylvester process, consisting of alternate washes of alum and soap, was tried, but with only partial success. The staff beads around exposed windows were taken off and reset in white lead, and a few broken shingles were replaced by new. A fence was built around the dwelling, and a hand rail was put up alongside the trail to the tower. A new steel-wire cable for a hoisting railway and a smokestack for the pumping engine were purchased.

798. *Point Pinos, entrance to Monterey Harbor, California.*—The following recommendation, which was made in the Board's annual report for the last two years, is renewed:

The plot of land owned by the Government at this station does not touch the sea at any point on its boundary line. For convenience in landing stores and supplies it is essential that the United States should own the strip of land between the light-house lot and the seacoast. The owners have offered to sell the land desired for \$2,000, and the Board recommends that an appropriation be made for its purchase.

813. *Mare Island, entrance to Karquines Strait, California.*—An area for a watershed was cleared and cemented, and pipe connections were made between it and the cisterns. The water supply should now be ample.

814. *Roe Island, Suisun Bay, California.*—Contracts for the construction of this station were let to Mr. M. A. Graham for the ironwork, and to the California Bridge Company for the construction of the buildings and wharf. Both contractors completed their work in a satisfactory manner and within the specified time. A small building, to contain the fog-bell machinery, was built on the outer end of the wharf, and a bell was purchased and hung. On February 16, 1891, the station was put in operation, when a fixed white light was exhibited from the lantern placed on top of the dwelling. It is of the fifth order, illuminating the entire horizon. The fog signal is a bell, which is struck by machinery one blow every ten seconds. During May a small oil house, a platform for coal, etc., under the wharf, and steps leading to the ground, were built.

— *New York Slough, entrance to San Joaquin River, California.*—The following recommendation, made in the Board's last two annual reports, is renewed:

This slough consists of a short deep passage from Suisun Bay, entrance to the San Joaquin River, and necessarily has to be used by all steamers, sailing vessels, barges, etc., engaged in the great river traffic. The steamers of the California Steam Navigation Company, with three other prominent lines, besides other steamers and sailing craft, all use the slough passage. As there are no lights, there are unavoidable accidents at night, and there have been frequent accidents in fog. The Board has placed post lights in the slough as a temporary expedient, but these have proved inefficient. It is therefore recommended that the proper steps be taken for placing a light and a fog signal here, and the cost is estimated at \$10,000.

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818. *Point Reyes, on the seacoast of California.*—The steam sirens in use here as a fog signal were removed and replaced by two 10-inch steam whistles. A new foundation was put under the large wooden cistern on the hill. Various repairs were made to the other structures.

— *Bodega Head, between Point Arena and Point Reyes light-stations, seacoast of California.*—The following recommendation, made in the Board's last two annual reports, is renewed:

It is recommended that a fog-signal station be established at Bodega Head, coast of California, a point 18½ miles to the northward of Point Reyes and 49 miles to the southward of Point Arena. The stretch of coast between Point Reyes and Bodega Head is the scene of many wrecks, due to foggy weather and uncertain currents. Vessels coming down from the north, bound to San Francisco, pass close enough to Point Arena to either see the light or to hear the fog signal there and take a new departure for Point Reyes. The coast line is generally straight as far down as Bodega Head; a fog-signal station at this point would give sufficient warning to vessels which have unconsciously got in there, to enable them to haul out in time to weather Point Reyes. It would be a great aid to vessels going into Bodega and Tomales Bays, as well as to those going into the landings and lumber chutes immediately above Bodega. Owing to the configuration of the land and other causes, it is extremely difficult to hear the Point Reyes signal anywhere to the northward of the point. Fog, accompanied by northwest winds varying from fresh to strong in force, prevails above Point Reyes during about nine months of the year. The currents are uncertain in direction either up or down the coast, and seem to be due to causes which exist far to the north. It has been noticed that indrafts prevail off the indentations in the coast, and the current close inshore runs in an opposite direction to what it does outside the headlands. The water is usually so deep in the regular routes up and down the coast that little if any use is made of the hand lead. A fog signal at this locality would therefore be of great benefit to mariners, and a small light would also be of much service, at little additional expense, as there is a stretch of unlighted territory about 68 miles in length between Point Reyes and Point Arena. The Government owns no land at Bodega; but 2 or 3 acres would be sufficient for the station, and could probably be bought for \$1,000. An engine-house, such as is being constructed at San Luis Obispo, with duplicate steam fog-signal whistles, and two single dwellings for the keepers, one to have a tower for the light, as at San Luis Obispo, the other for the assistant keeper, similar to the new one designed for Point Loma light station, with coal shed, oil house, outhouses, etc., will probably suffice to establish the station. These it is estimated will cost \$30,000, and it is recommended that an appropriation of this amount be made therefor.

820. *Cape Mendocino, seacoast of California.*—The road leading from the county road to this station is in bad condition. For several years this piece of road, a little more than a half mile in length, was almost impassable, and it is only with great difficulty and at an excessive cost that teams can be hired to transport supplies to the station, and all in consequence of this little piece of bad road. Repairs are made annually, but the grade is so steep, the rainfall so heavy, and landslides so frequent that it is practically impossible at any reasonable expenditure of money to maintain this road in even a fair traveling condition. Surveys for a practicable road to reach the station were made. Some 1,120 feet of the proposed new road are over land the owner of which offers to convey the right of way to the United States.

Twelfth District.

The following recommendation, made in the Board's last two annual reports, is renewed:

There is no practicable means of communication between the county road and the light-station. A good wagon road about a half mile long has been laid out; but it is found that while about 1,550 feet of its length is on the Government reservation, some 1,120 feet are on private property. The owner offers to sell the right of way, 25 feet wide over this strip, for \$25. The cost of making the road will be about \$500. The amount of the cost of making an examination of the title and other legal expenses must be provided. It is therefore recommended that an appropriation of \$1,000 be made for the purchase of the right of way, for the legal expenses of so doing, and for building the road.

821. *Humboldt, entrance to Humboldt Bay, California.*—Congress at its last session appropriated \$25,000 for the reestablishment of this station on a new site. The Light-House Board having decided that the best interests of navigation would be subserved by locating the new station on Table Bluff, a point about 4 miles south of the present light, the inspector and engineer of this district visited the place on May 8, 1891, and selected a site for the station. The owner of the selected land refused to sell for less than \$5,000 for about 10 acres of land and the right of way for a road from the county road to the proposed station. This price was deemed exorbitant, and measures were initiated to acquire title by condemnation. The matter is now in the hands of the United States attorney. Meantime the Board is trying to effect a compromise, and thus get title with an expenditure of less time and money than by awaiting the slow motion of the courts.

822. *Trinidad Head, seacoast of California.*—A new tank was erected and the spouts on the dwelling were arranged to fill it. The Board requested a report from the district officers upon the need of a fog bell at this station, and on November 14 one was submitted, stating that it was inadvisable to establish such a fog signal there, as the elevation of the station would render the sound of a bell inaudible at sea level.

— *Punta Gorda, between Shelter Cove and Cape Mendocino, seacoast of California.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

Between Shelter Cove and Punta Gorda there are several dangerous sunken rocks off the shore that add to the hazards of navigation. In ordinary dark nights the overhanging mountains keep the shore line in dark shadow and confuse the best navigator as to his distance from shore, so that it is impossible to make out this high rounding point either from the south or from the north. Moreover, from reports made to the Coast and Geodetic Survey, it appears that little is known as to the currents of this part of the coast. The conclusion is reached, therefore, that the interests of commerce and navigation require that a light and fog signal be established at or near Punta Gorda, Cal. It is estimated that the work will cost \$40,000.

824. *St. George Reef, Northwest Seal Rock, seacoast of California.*—By the middle of the first month of the fiscal year all the stone required for the completion of this work was quarried and cut, when the avail-

Twelfth District.

able funds not being sufficient to warrant resumption of construction, all work was shut down, the plant stored at the stone yard, and that place left in charge of a watchman. During the year the specifications and drawings for the metalwork for the tower were prepared and contract was made with the Phoenix Iron Company of Trenton, N. J., for its construction. By the end of the fiscal year it was completed and on its way to San Francisco. An item in the general deficiency act approved September 30, 1890, appropriated \$81,000 for the completion of this station. Early in April, 1891, the steamer *Sunol* was chartered to act as a supply steamer for the work. Supplies were purchased, men employed, and on April 10 the steamer sailed for Humboldt Bay, where she discharged her cargo, took on board the material for setting moorings, and started for the rock. Very bad weather was encountered, so that at first little was accomplished. By the end of the month, however, the moorings were set and the first landing for the season made on the rock. The workmen's quarters were found to have been utterly destroyed by the waves and had to be rebuilt. The mooring buoys had disappeared and the moorings had to be grappled for and the buoys reset. By the 1st of May the work of actual construction commenced and was vigorously pushed whenever the weather permitted. At times the wind was so violent that the steamer was unable to land material, and the masons were driven from the outer walls by its force. Nevertheless the progress made was excellent and the work advanced more than was expected to be possible at the time. At the end of the fiscal year the pier pavement was finished, the base of the tower was completed, and the tower with its brick lining was built and backed up for 30 feet above the base, or nearly to the window sills of the third story. The work is now at such an advanced stage that, barring accidents, its completion this season is probable.

— *San Clemente Island, about 60 miles west of Point Loma, seacoast of California.*—In July, 1890, a report was made by the district officers recommending the site to be reserved on this island for light-house purposes. A survey of the sites required, and also of the roads leading thereto, is now being made.

REPAIRS.

During the fiscal year repairs and renovations, more or less extensive, were made at the following-named stations:

793. Santa Barbara, Cal.
794. Point Conception, Cal.
796. Piedras Blancas, Cal.
800. Año Nuevo Island, Cal.
801. Pigeon Point, Cal.
802. Point Montara, Cal.
803. Farallon, Cal.

804. Bonita Point, Cal.
805. Fort Point, Cal.
806. Lime Point, Cal.
809. Yerba Buena, Cal.
810. Oakland Harbor, Cal.
812. East Brother Island, Cal.

Twelfth District.**LIGHT-SHIPS.**

— *Wreck of Palestine Light-Vessel, San Francisco Bar, California.*—The ship *Palestine*, bound from Tacoma to San Francisco, with 2,500 tons coal on board, struck on the bar in attempting to enter this port about 7 a. m. on June 26, 1891, and soon after sunk in about 14 fathoms of water just outside the bar. She settled in an upright position, heading S. by W. $\frac{1}{2}$ W., with topmasts and topgallant masts out of water. In order to mark this dangerous obstruction to navigation, a temporary light-ship was immediately moored 100 yards to the westward of the wreck in 16 fathoms of water. This vessel is schooner-rigged, showing two fixed white lights from her mastheads, each 45 feet above the sea. The hull is painted brown with the word "Wreck" in large white letters on each side. During thick or foggy weather a bell is sounded with rapid blows for five seconds, at intervals of two minutes. The schooner *Samson* was chartered for use as a temporary light-ship. The wreck of the *Palestine* was sold at auction on June 27. Her purchaser has begun to cut out the masts and rigging and blow out her decks, to recover chains and anchors. When he finishes this, there will probably be enough water over the sunken hull to permit of safe navigation in that vicinity with the aid of a bell buoy.*

832. *Columbia River Light-Vessel No. 50.*—An additional appropriation of \$10,000, having been made by the act approved August 30, 1890, for building a light-vessel to mark the bar at the mouth of the Columbia River, Oregon, the appropriation of \$60,000 made by the act approved March 2, 1889, being found inadequate, new bids were asked by public advertisement. The contract was let for \$60,150 to the lowest bidder. The vessel is being built in San Francisco, under the direction of the

* This light-ship was removed July 22, 1891, and a first-class bell buoy, painted green, was moored 100 yards west of the wreck in 16 fathoms of water, on the same location that the light-ship occupied. This was done as the purchaser of the wreck had removed the masts and rigging, and reported a depth of 5 fathoms at low water over the end of the jib boom and $9\frac{1}{2}$ fathoms over the forecastle deck. The Navy Department then, at the instance of the Light-House Board, ordered the commandant of the Mare Island Navy-Yard to have the wreck blown up.

He directed Commander Charles E. Clark, U. S. N., chief of ordnance of the yard, to carry out the orders. There being no naval vessel which could be used for the purpose, application was made to the light-house inspector at San Francisco for the use of the light-house tender *Madroño*. This was granted, and on August 17, 1891, the *Madroño* carried the apparatus and the torpedoes to the site of the wreck, the Navy Department tug *Ivy* accompanying her. It took five hours to place the torpedoes, loaded with 34 pounds of gun cotton each. Then they were fired by electricity one at a time. The explosion caused the water to rise to a height of 6 feet and tons of wreckage to float about. Myriads of fish killed by the concussion also floated, and were gathered up in sufficient numbers to fill several boats. The wreck was thoroughly destroyed, and it is no longer a danger to commerce. The acquiescence by the Navy Department to the request of the Light-House Board, and the prompt action in this case, was of great value to commerce.

Twelfth District.

inspector of the twelfth light-house district. The steel plates, beams, and angles for light-ship No. 50, were made in Pittsburg, Pa., and in Phoenixville, Pa., and these materials were tested by officers of the Light-House Board at the manufacturers' establishments. Upon the completion of the tests and the acceptance of the steel, the material was shipped to San Francisco. The work on the vessel is somewhat delayed by the nonarrival of part of this material from the east, but all is being done that is possible under the circumstances. The keel has been laid, the boilers are under construction, the boiler heads are being flanged, the tube plates drilled, the main-deck beams are having brackets welded, and all minor work is progressing satisfactorily. A fresh water distilling apparatus is being supplied by the Board to this vessel.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

794. *Point Conception, California.*—The 12-inch steam whistles, in duplicate, were in operation 251 hours, and consumed about 28 tons of coal.

795. *San Luis Obispo, California.*—The 10-inch steam whistles, in duplicate, have been operated 648 hours since the time of their establishment, August 10, 1890, consuming about 47 tons of coal.

797. *Point Sur, California.*—The 12-inch steam whistles, in duplicate, were in operation 1,333 hours, and consumed about 79 cords of wood.

800. *Año Nuevo Island, California.*—The 12-inch steam whistles, in duplicate, were in operation 640 hours, and consumed about 38 tons of coal.

801. *Pigeon Point, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation 457 hours, and consumed about 53 cords of wood.

802. *Point Montara, California.*—The 12-inch steam whistles, in duplicate, were in operation 881 hours, and consumed about 90 cords of wood.

803. *Farallon, California.*—The first-class steam siren, in duplicate, was in operation 691 hours, and consumed about 53 tons of coal.

804. *Bonita Point, California.*—The first-class steam siren, in duplicate, was in operation 1,137 hours, and consumed about 92 tons of coal.

806. *Lime Point, California.*—The 12-inch steam whistles, in duplicate, were in operation 808 hours, and consumed about 82 tons of coal.

809. *Yerba Buena Island, California.*—The 10-inch steam whistles, in duplicate, were in operation 96 hours, and consumed about 9 tons of coal.

812. *East Brother Island, California.*—The 12-inch steam whistle was in operation 89 hours, and consumed about 9 tons of coal.

818. *Point Reyes, California.*—The 12-inch steam whistles, in duplicate, were in operation 911 hours, and consumed about 76 tons of coal.

Twelfth District.

On September 30, 1890, the 12-inch steam whistles were established in place of the steam sirens.

819. *Point Arena, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation 1,145 hours, and consumed about 132 cords of wood.

821. *Humboldt, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation 871 hours, and consumed about 82 cords of wood.

BUOYAGE.

The buoyage of this district is in excellent condition, and every buoy is in its place. The bell buoy which was mentioned in the last two annual reports as having gone adrift from Noonday Rock in November, 1888, and which was frequently reported by passing vessels as at various points off the coast, was finally picked up on the beach at one of the Sandwich Islands. As \$800 was demanded for its delivery at Honolulu, the buoy was abandoned. The whistling buoy off Point Sur, California, went adrift on August 20, 1890, and was recovered in good order on August 27, by the light-house tender *Madroño* in the vicinity of Piedras Blancas. As a notice to mariners had been issued stating that this buoy was to be discontinued in September, it was not replaced. The changes authorized in the buoyage of the approaches to Port Harford, Cal., were made on September 15, 1890. The whistling buoy near Souza Rock was taken up and replaced with a bell buoy, and the whistling buoy was placed off Point Buchon in 19 fathoms of water. On May 8, 1891, the bell buoy marking Noonday Rock, 3 miles to the westward of the North Farallon Island, California, parted its moorings and floated away. A few days later it was picked up by the tug *Vigilant* some 10 miles southwest of the Farallon light-house, was towed into San Francisco Bay, and delivered to the light-house inspector. The *Madroño* succeeded in replacing this important buoy. When searching for this rock, which is difficult to locate because of its small area and great distance from shore, it is an interesting circumstance to note that advantage can be taken of the habits of the seals feeding there. Upon blowing the steam whistle of the light-house tender, when sure of being in the vicinity, the seals rise perpendicularly to the surface of the water sticking their heads high into the air out of curiosity to learn the cause of the extraordinary noise. With the surfboat already lowered, a trial buoy can be thrown almost exactly over the rock, thus saving hours of tiresome search. The buoy list describes this aid to navigation as being situated 100 yards W. $\frac{3}{4}$ N. from the rock and in range with it and the west end of the North Farallon. The attempt is made to keep the buoy as near this position as possible, but because of the great length of moorings necessary to hold it, there is a wide radius to the circle possible for it to swing in; so, with strong currents and winds setting to

Twelfth District.

the eastward, it might not be more than 100 feet from the hidden danger. Therefore, it is necessary to be cautious in navigating in this vicinity and vessels are warned against attempting to pass between the buoy and the rock.

As this is the third bell buoy that has gone adrift from Noonday Rock within two years, it seems proper at this time to inquire into the circumstances and remedy the fault if possible. The position occupied by this aid to navigation is singularly exposed, far out at sea, where winds and waves and currents are all strong, and the shaking and the working of the moorings are almost incessant. The bottom is rough and jagged, with pinnacles rising here and there, well calculated to cut and chafe the moorings. The rock has 18 feet of water on it and the buoy, which is only 100 yards distant, is anchored in 23 fathoms. The buoy in use is the regular approved pattern of bell buoy built by the Light-House Department for general use throughout the Establishment, and it is particularly well adapted for its purposes when used in harbors or in inland waters, but it does not meet the requirements demanded by this Pacific Ocean exposure. Because the buoyancy was not enough to hold up the weight of chain required in this deep water, Commander Ludlow, when inspector of this district, contrived an ingenious wire pennant, very much lighter than half-inch chain, that reached from the bridle of the buoy to a depth of 15 fathoms. A thimble was spliced into the lower end of this pennant, and a shackle was secured by a chain to this thimble, thus reducing the weight of moorings and bringing the chafe of the bottom on a heavy enough chain to bear it. It was supposed that the difficulties of the question were thus solved, but the constant pulling, tugging, and dragging of the heavy chain on this pennant, draws the splice, no matter how well the work is done. This was the cause of the breaking adrift of the second buoy. The third buoy, upon recovery, was found to have the pennant intact, the cause of its going adrift being a defective shackle. So, while the pennant seems to do sometimes, it is not altogether trustworthy. The Board has therefore had one of these buoys specially altered, by having it built up one additional course higher, so that greater buoyancy can be secured, enough to hold up a seven-eighths-inch chain reaching down for 15 fathoms, where a 2-inch chain can be shackled, which will take the chafe of the bottom. A bell buoy is now being thus altered and it will be used soon to replace the present buoy at Noonday Rock.

On June 28, 1891, a first-class can buoy, painted with red and black horizontal stripes, was placed to mark Von Helms Rock, recently located by the Coast Survey steamer *Hassler*, under Lieut. D. Delehanty, U. S. Navy, commanding, off the coast of California in the vicinity of San Simeon. The buoy is anchored in 21 fathoms of water, 150 yards SW. by W. from the rock, which has 15 feet on it at low water.

Twelfth District.*Whistling buoys in position.*

San Diego Bar, California.—A second-class whistling buoy, in good condition.

Point Arguello, California.—A second-class whistling buoy, in good condition.

Point Buchon, California.—A second-class whistling buoy was placed off this point, in 20 fathoms of water, on September 15, 1890. The buoy is in good condition.

Piedras Blancas, California.—A second-class whistling buoy, in good condition.

Point Pinos, California.—A second-class whistling buoy, in good condition.

Santa Cruz, California.—A second-class whistling buoy, in good condition.

San Francisco Bar, California.—A first-class whistling buoy, in good condition.

Saunders Reef, California.—A second-class whistling buoy, in good condition.

Fort Bragg Landing, California.—A second-class whistling buoy, in good condition.

Blunts Reef, California.—A first-class whistling buoy, in good condition.

Humboldt Bar, California.—A second-class whistling buoy, in good condition.

Crescent City, California.—A second-class whistling buoy, in good condition.

Whistling buoys discontinued.

Point Sur, California, August 20, 1890.

San Luis Obispo Bay, California, September 16, 1890.

Bell buoys in position.

San Diego Bar, California.—A first-class bell buoy, in good condition.

Wilmington Harbor, California.—A first-class bell buoy, in good condition.

San Luis Obispo Bay, California.—A first-class bell buoy, in good condition.

San Francisco Bar, California.—A first-class bell buoy, in good condition.

Other buoys in position.

San Diego Bay.....	8
Wilmington Harbor.....	2
San Luis Obispo Bay	2
Esteros Bay	4
San Simeon Bay.....	1
Half-Moon Bay.....	3
San Francisco Entrance.....	8

Twelfth District.

San Francisco Bay	11
Oakland Harbor	5
San Pablo Bay	7
Suisun Bay	18
Eel River Bar	1
Humboldt Bay	12
Crescent City Harbor	1
Total	83

Buoys discontinued, no longer necessary.

Wilmington Harbor, two black spar buoys, June 30, 1891.

DEPOT.

Yerba Buena Island, California.—The keeper's dwelling has now two extra rooms. New boatways were made to be used in hauling out the small boats belonging to the service, for repair and painting the bottoms; and various repairs were made. All the buildings are well painted or whitewashed and are in a good state of preservation. The coal sheds are used for the storage of mineral oil, of which a considerable quantity is always on hand, as the fuel for vessels and stations is obtained under contract in San Francisco. This obviates the need of bagging coal at the depot, which took up so much of the time of the tender's crew when they could be more profitably employed.

TENDERS.

The Madroño.—This steamer was actively employed during the entire year, except when laid up for necessary repairs to boilers and engines, and to clean and paint her bottom. Twice during the past year she was on the dock, and in all was laid up for about twenty-seven days. She replaced 23 buoys, changed 52, cleaned and painted 41, and repaired and painted 33 beacons, landed 547 tons of coal at some 20 different stations, and did 893 hours' work at the buoy depot. She delivered the annual supplies and rations to 28 stations, and conveyed the inspector to nearly all the 31 stations in this district, making 111 inspections during the year. In doing this she steamed about 8,420 miles and consumed some 939 tons of bituminous coal. The *Madroño* was last on the dock April 7, 1891, when her bottom was cleaned and painted, and the corroded riveting about the rudderpost was repaired. It was found that the antifouling paint, which was applied at the previous docking, was markedly beneficial, the amount of marine growth being much less than at other times when the vessel has been taken out of the water. This same antifouling paint was again mixed with the final coat. A new range was supplied, and a best bower anchor was furnished to replace the one lost in Drakes Bay in April. The boilers and engines are in an efficient condition, the hull of the vessel is in good condition, and the boats, sails, rigging, and other equipments are in good order.

THIRTEENTH DISTRICT.

ict extends from the southern boundary of Oregon to the
ne between the United States and British Columbia, and
l the aids to navigation on the Pacific coast of Oregon and
1, and the Columbia and Willamette Rivers, Strait of Juan
iget Sound, and Alaskan waters.

—Lient. Commander William W. Rhoades, U. S. Navy.

—Maj. Thomas H. Handbury, Corps of Engineers, U. S.

in this district—

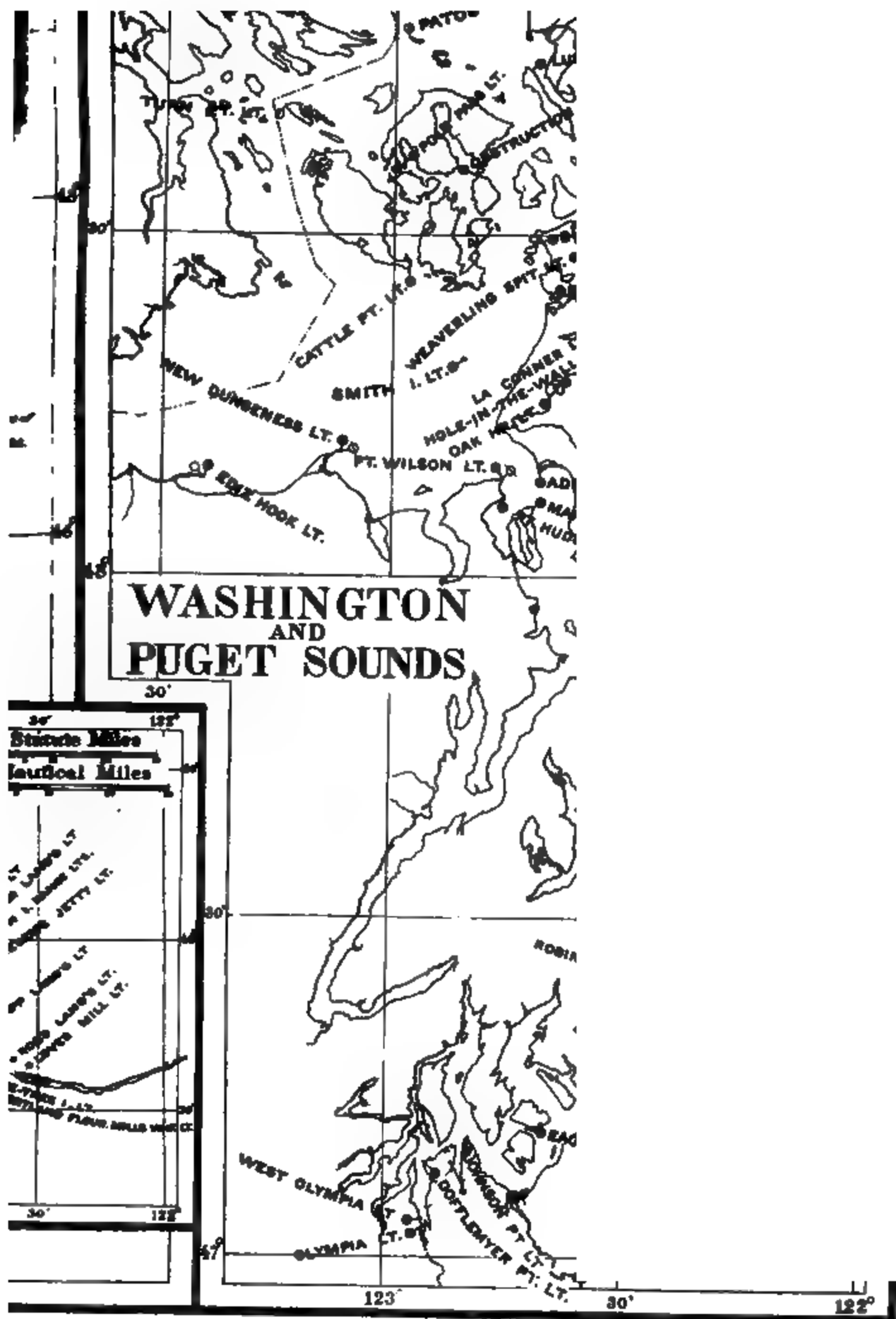
and beacon lights.....	16	}	93
the Columbia and Willamette Rivers.....	47		
Puget Sound and adjacent waters.....	30		
ted beacons.....			33
perated by steam or hot-air engines.....			6
perated by clockwork.....			3
oys in position.....			7
position.....			2
n position (including 30 in Alaskan waters).....			190
avits, buoy tender and for supply and inspection.....			1

LIGHT-HOUSES.

Ue River, at the mouth of Coquille River, seacoast of Oregon.—
ongress, dated March 3, 1891, \$50,000 was appropriated for
fog signal at the mouth of the Coquille River.

Arago, Oregon.—Under authority from the Board a con-
ntered into for the construction and erection of a wire-rope
etween the mainland and the station. The work is well
but it is not yet completed. Various repairs were made.

Bay and River beacon lights, Oregon.—It is found that to en-
to cross Coos Bay Bar at high water, which are, owing to
ften obliged to navigate the bay at night, it is needful to
rtain beacon lights. It is proposed to establish a red light
pire City at Jarvis Landing, on the west side of the bay
ney Slough; a white light on North Slough Point; a white
wreck near Buoy No. 3; a white light on the edge of the
ow Marshfield Point; a white light at Marshfield near the
oos River; a white light at the entrance to Marshfield Chan-
e light on the left bank of the Marshfield Channel, between
t and Kitchen Slough, and a white light at Kitchen Slough
bank of Coos River Channel. It is estimated that it will
establish these beacon lights, and it is proposed to do this
ate of funds at the disposal of the Board for this purpose



Thirteenth District.

827. *Umpqua River, seacoast of Oregon.*—Bids were received and opened April 21, for the construction of the dwellings, barn, oil houses, cisterns, tower, and metalwork of this station. The lowest bid received for the metalwork was for \$5,020 and a contract will be made in this sum for doing the work. The aggregate of the lowest bids for the construction of dwellings, etc., and the erection of the tower, being greater than the balance available for the work, the bids were rejected and advertisement will be made for new proposals for doing this work.

828. *Heceta Head, near the mouth of Siuslaw River, between Cape Arago and Cape Foulweather, seacoast of Oregon.*—A title to the land on which this station is to be located has been secured; also right of way over private property for a wagon road to lead from the station to the nearest public highway, distant about 7 miles. Proposals for the construction of this road were obtained by advertisement and the lowest bid was accepted. The contract will be made and the road constructed as soon as certain public lands over which this road runs can be reserved. The preliminary work necessary before advertising for bids for the construction of the tower, buildings, etc., is completed.

— *Yaquina Bay, Oregon.*—The following recommendation, made in the Board's last annual report, is renewed:

Vessels now have occasion to pass in and out of the bay during the night, and lights are needed to prevent accidents. During a part of the year the mail has to be carried before daylight in the morning and after dark at night. The necessities of commerce in this locality are such as to demand the establishment of inexpensive lights at this point. It is estimated that they could be established at a cost of about \$300, and it is recommended that an appropriation of that amount be made therefor.

829. *Cape Foulweather, Oregon.*—A 3,000-gallon redwood water-tank was put up near the barn, with new eave-troughs to the outbuildings, to increase the water supply.

830. *Cape Meares, south of Tillamook Bay, seacoast of Oregon.*—Picket fences were built around the dwellings, and barbed-wire fences were put up around the clearing. A substantial walk was laid from the tower to the dwellings. A wagon road leading from this station to some public highway is now urgently needed. Several lines for this road were surveyed, and the cost of construction estimated. The most convenient and practicable was selected. It is in a locality where its construction will add materially to the development of the country. This is what is locally known as the "short beach route." Leaving the station it runs southerly along the face of the bluff next to the ocean for a distance of about $1\frac{1}{2}$ miles, thence due east $4\frac{1}{4}$ miles to Tillamook River. The unexpended balance on account of the appropriation for Cape Meares light-station is about \$9,000. Of this amount \$5,000 can be expended in the construction of this road, leaving the balance for other necessary work.

Thirteenth District.

831. *Tillamook Rock, 18 miles south of the entrance to the Columbia River, seacoast of Oregon.*—The telegraph line between Fort Stevens and the beach opposite this station was repaired and put in good order, and a reel for holding the cable was made. On the rock a recess was partially cut out for the cable to lie in, but it could not be completed on account of prevailing high seas. The north fog-signal boiler was repaired by renewing the legs of the fire box, putting in new stay bolts, etc., the siren was overhauled and new steam-pipe connections were put in.

— *North Head, Cape Disappointment (Hancock), seacoast of Washington.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

The present light at Cape Disappointment is inadequate for the purposes of commerce and navigation. It is believed that if North Head is marked by a first-order light, and the proposed light-stations at Grays Harbor and Destruction Island are completed, that the Pacific coast will be well supplied with lights of the first order from Cape Flattery to Tillamook Rock. Proper measures should be taken for the establishment of a first-order light at North Head. This, it is estimated, will cost \$50,000. It is recommended, therefore, that this sum be appropriated for this purpose. When this light is established, the first-order light at Cape Disappointment will no longer be necessary, and it is proposed to then reduce it to a light of the fourth order. It will then be of sufficient power to benefit vessels close to the bar outside and vessels in the Columbia River.

833. *Point Adams, Oregon.*—A barn was built by contract for \$500, the plastering of the dwelling was repaired, and new front steps were built.

— *Grays Harbor, seacoast of Washington.*—The following recommendation, made in the annual reports of the Board for the last four years, is renewed:

By the act approved July 7, 1884, Congress appropriated \$15,500 for the establishment of a light at this place. While the negotiations for the purchase of a site for the light thus authorized were being carried on, the inadequacy of the small harbor light it was proposed to erect to meet the demands of the commerce and navigation of this part of the Pacific coast became apparent, together with the necessity for the establishment of a first-order coast light about 4 miles north of the site selected for a harbor light. This matter was considered by the Board at its session held on February 3, 1886, when it was ordered that the proper steps be taken to have \$60,000 added to the existing appropriation, to enable the Board to erect a first-order light about 4 miles north of the site selected at Point Brown for the Grays Harbor light. The Board therefore recommends that an appropriation of \$60,000 be made for the establishment of a first-order light instead of for a harbor light as originally intended, and that the \$15,500 appropriated by the act of July 7, 1884, be made applicable to the same purpose.

885. *Destruction Island, seacoast of Washington.*—A barbed-wire fence was put around the dwellings, the derrick was overhauled, the grounds were cleared and seeded down, the sirens examined and extra fittings added to the machinery, and various other minor repairs were made.

Thirteenth District.

contractors for the erection of the dwellings, cisterns, barn, fog bell, left their work unfinished and some of it was poorly done. On notice to the contractors this unfinished work was completed and defective portions of the work were remedied by hired labor and use of material in open market. The dwellings, barn, and cisterns were repainted and new concrete floors were laid in the cistern dwelling. An attempt was made to repair the cisterns by coating the bottoms and sides with a thick coating of cement mortar, but did not prevent the ground water from coming into the cisterns through the sides. Upon investigation by digging the earth from the cisterns, it was discovered that the bricks had been poorly laid and cement plaster had been put upon the outside as required by specifications. The work of repairing these cisterns is now in progress.

This work is all being paid for from the retained percentage on the contract. The contractor for the erection of the tower put in the foundation last October and has now a force of men at work erecting the tower, and it is expected that he will finish his work by this fall and that then the light can be exhibited.

Pe Flattery, on Tatoosh Island, entrance to the Strait of Juan de Fuca, Washington.—A new oil house of corrugated iron was built, the boiler and fog-signal house were repaired. The boiler was in need of rough repair, new water pipes were laid from the cistern to the boiler and the iron covering of the watchroom of the tower was replaced.

A new derrick with a hoisting engine and a car was purchased to raise the supplies from the beach to the top of the rock and then to the station. Contract was made for a return tubular bell for the fog signal. The following recommendation, made in the last three annual reports, is renewed:

It is decided that the location of the fog signal ought to be changed to West Point so that it can be heard from the latter point much more distinctly by passing vessels. Change of location, it is estimated, will cost \$17,000, and it is recommended that appropriation be made accordingly.

West Point, Dungeness, Washington.—Some 500 feet of water pipe was laid connecting the fog signal with the cisterns at the dwelling.

Point No Point, west end of Stuart Island, Canal de Haro, Washington.—By act of Congress, approved March 3, 1891, \$15,000 were appropriated to establish a light and fog signal here. An inspection of the ground was made and the site was selected.

Point No Point, Washington.—By act of Congress, approved March 3, 1891, \$12,000 were appropriated to establish a light and fog signal here. An inspection of the ground was made and the site was selected.

894. *Point No Point, Washington.*—A severe storm visited this station March 9, doing much damage to the bulkhead and grounds. A con-

Thirteenth District.

tract was made for its complete repair and the work will be commenced at once. A new lightning rod was attached to the tower, and various minor repairs were made.

896. *West Point, Puget Sound, Washington.*—Both fog-signal engines were overhauled and put in repair, a storm door was put on the tower and a porch on the keeper's dwelling. The stone revetment having settled and the tower being endangered by high seas a contract was made for placing in position about 250 cubic yards of stone which it is hoped will permanently protect the point.

— *Post-lights in Puget Sound and its tributary or adjacent waters, Washington.*—The following recommendations, which were made in the annual report of the Board last year, are renewed:

The post-lights in the Columbia and Willamette Rivers, in Puget Sound, and in adjacent waters are of great benefit to navigation, and night boats now run regularly on the Columbia and Willamette rivers. They are of much use during fog, as the lights can be seen, except in very dense fogs, at a distance of 100 yards or more and the pilots rely on the lights for a new departure. Without their aid night boats could not run regularly. The demand for these lights on Puget Sound and its tributary rivers is increasing with the growing commerce. The Board recommends therefore, the establishment of thirty post-lights along the navigable channels of the Suohomish River, the Skagit River, the Nooksack River, and the La Connor Slough and along such other channels of Puget Sound and the rivers tributary thereto, in the State of Washington, as may be necessary to meet the requirements of commerce. It is estimated that they can be built and maintained for a year for a sum not exceeding \$10,000. It is therefore recommended that an appropriation of this amount be made.

— *St. Marys Island, seacoast of Alaska.*—The following recommendation, which was made in the annual report of the Board last year is renewed:

The commerce of Alaskan waters is rapidly increasing. Shipmasters and vessel owners have petitioned for the establishment of a light-house and fog signal at the point. But little is known of the character of the ground and of the building facilities there, but it is estimated, after a study of what is known, that a light-house and fog signal can be established there at a cost not exceeding \$80,000, and it is recommended that an appropriation of this amount be made therefor.

POST-LIGHTS.

The keepers performed their duty well and the lights were efficiently maintained. Numerous petitions were received asking the establishment of more lights on Puget Sound and adjacent waters, Columbia and Willamette Rivers, and at other points in this district, but funds therefor were not available. Post-lights not only reduce the liability of vessels to disaster, but also make it almost as easy and as safe for them to navigate these waters by night as by day. Supplies were delivered to the tender to all the lights, the posts were renovated or replaced, and other necessary work was done by the crew of the light-house tender *Manzanita*.

Thirteenth District.**REPAIRS.**

Repairs were made at the following-named stations:

825. Cape Blanco, Oregon.

883. Cape Disappointment, Wash.

884. Willapa Bay (Shoalwater Bay), Wash.

887. Ediz Hook, Wash.

889. Smith Island, Wash.

890. Admiralty Head, Wash.

891. Point Wilson, Wash.

898. Robinson Point Post-Light, Wash.

LIGHT-SHIP.

832. *Columbia River Light-Vessel, No. 50.*—By the acts of Congress approved March 2, 1889, and August 30, 1890, \$70,000 were appropriated to build this light-ship. Plans were drawn, specifications were prepared, and contract was made for her construction as soon as practicable. She is now being built in San Francisco, and under the contract she is to be finished in January, 1892.

DAY OR UNLIGHTED BEACONS.

The following-named beacons were established in Alaskan waters:

Eye Opener Rock, Sumner Straits.—An iron spindle, 20 feet high, surmounted with a barrel set on end, painted black and white horizontal stripes.

Prolewy Rock, Wrangell Narrows.—An iron spindle surmounted with a barrel on end, painted black and white horizontal stripes.

Killsnoo Harbor, Chatham Straits.—Beacon erected on the south side of Kenasnow Island.

The following-named beacon was discontinued in Alaskan waters:

Hanus Reef, Icy Straits.—An iron spindle, 20 feet high.

It was impracticable on account of the ice to keep the spindle in position.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

831. *Tillamook Rock, Oregon.*—This first-class steam siren in duplicate was in operation about 211 hours, and consumed about 12 tons of coal and 33 cords of wood.

886. *Cape Flattery, Washington.*—This 12-inch steam whistle was in operation about 583 hours, and consumed about 22 tons of coal and 28 cords of wood.

888. *New Dungeness, Washington.*—This 12-inch steam whistle was in operation about 626 hours, and consumed about 43 tons of coal and 16½ cords of wood.

891. *Point Wilson, Washington.*—This 12-inch steam whistle was in operation about 593 hours, and consumed about 33 tons of coal and 63 cords of wood.

Thirteenth District.

896. *West Point, Washington.*—This Daboll trumpet was in operation about 445 hours, and consumed about 4 tons of coal and 15 cords of wood.

898. *Robinson Point, Washington.*—This 12-inch steam whistle was in operation about 316 hours, and consumed about 18 tons of coal.

BUOYAGE.

Owing to the large number of buoys to be maintained in position, the time lost because of bad weather, heavy westerly swells, bar-bound harbors and shifting channels, it was impossible for one tender to change all the buoys every six months, as required by the regulations, besides attending to other work of supply, inspection, construction and repair. During the year two of the whistling buoys went adrift, one from Grays Harbor, which was recovered, and one from off Coos Bay, Oregon, which has never been seen since. It must have been run into and sunk. Nearly all the buoys, including those in Alaskan waters, were painted, changed, and replaced. The buoyage of the district is in good condition.

DEPOT.

Tongue Point, Columbia River, Oregon.—The keeper's dwelling and grounds are in good condition, but the barn is a mere shed. The storehouse and coal shed are in good repair, but the depot wharf is in need of immediate attention. The wharf was temporarily repaired and a few small repairs were made to the dwelling. By act of Congress, approved March 3, 1891, an appropriation of \$15,000 was made for removing the buoy and supply depot, now at Tongue Point, to Astoria, Oregon, and for the purchase of a site at the latter place and the construction thereon of a suitable wharf for the use of the Light-House Establishment. This matter was referred to the inspector and engineer of the district for investigation. Their joint report, made on May 23, 1891, explains fully the situation at the present time. From this the following is quoted:

On receipt of this letter we proceeded at once with such preliminary steps as seemed to be necessary to carry out the requirements of the law. The first point to be decided being the limit along the water front of Astoria where a buoy depot might be located to better advantage than its present location at Tongue Point. The next point was, what can sufficient ground and water front in that locality be purchased for, and what will be the cost of the erection of a suitable wharf, sheds, storehouses and other buildings, and the removal of all the paraphernalia of the present depot thereto. Due notice having been given by posters and otherwise that the Government contemplated the purchase of property for buoy depot purposes in Astoria, those having water-front property for sale were requested to communicate with the light-house engineer. As the result of this invitation our attention was called to ten different pieces of property, all of which we examined and found no one that for some one or more reasons would not be desirable for buoy depot purposes. Other pieces of property that we looked at and thought desirable we found on inquiry to be not for sale or held at such high figures as to at once discourage further attempts at negotiation. This canvass of the situation revealed the fact that

Thirteenth District.

at the rates at which property that would be at all desirable for buoy depot purposes or by which we could better our present situation is now held in Astoria, the whole amount of the available appropriation would be totally inadequate to the purchase of the necessary water front, to say nothing of the building of the wharf, storehouses, etc, which would cost probably as much more. Several years ago when the question of a change in the location of the buoy depot for this district was first brought to the attention of the Board, water-front property in Astoria could at that time be purchased at a very reasonable figure, and it is quite probable that with the amount of the appropriation all the property then needed for depot purposes could have been bought and the wharf built, but circumstances have changed since then. Within the last year or two Astoria has become a city with great immediate expectations. The prices asked for its water-front property have advanced greatly and it is quite probable that there will be still further advance. It is now questionable whether the necessity for a change in the location of the buoy depot is commensurate with the cost it would entail upon the Government. The Government now owns at Tongue Point a piece of ground on which the buoy depot is located, containing about 5 acres, with a water front of about 500 feet. This was about 3 miles from Astoria, but of late the town has been growing in that direction so that this distance is much less. It is expected that in a very few years streets and roads will be graded quite up to the depot grounds. This will obviate the difficulties in the way of communication with Astoria that were formerly great objections to this location. There is need of much larger space for the buoy depot requirements of this district than when the question of this change was first brought up, and more and more space will be required as the necessities of commerce demand more aids, which must from time to time be assembled here. In view of the facts above shown we would respectfully recommend that Congress be requested to permit the funds herein mentioned to be expended in repairs and additions to the wharf at the present buoy depot, instead of attempting to expend it in the manner prescribed. It is proposed that the head of the present wharf, which is 130 feet long, be extended 200 feet. This will give ample room with deep water for the tenders to lie alongside, and also for light-ship and other boats that may from time to time be required at the depot. It will also increase to something like adequate size the space required for storage of new light-house material, buoys, chains, sinkers, and other supplies necessary for the wants of the district. It is estimated that this extension of the wharf will cost, approximately, \$10,000, and that \$5,000, at least, will be consumed in building a new storehouse and repairs to the old wharf.

Shop.—The clockwork formerly used at Cape Arago has been partly placed in repair, the gearing of other clockworks repaired and renewed, the stake lamps and the burners for the lamps repaired and float chambers set. The machinist has been busily engaged during the year in repairing boilers, engines, and machinery at the various stations throughout the district.

TENDERS.

The Manzanita.—This tender is in fair condition. On August 24 last, she returned to the station from San Francisco, where she received a new boiler. Since that time she has been quite efficient and the new boiler has given satisfaction. The tender was employed in landing at the different stations supplies and fuel, in transporting mechanics and material for repairs and construction at isolated light-stations, in working the buoys, in attending to the post-lights, and in inspection trips.

Thirteenth District.

During the year she conveyed the inspector each quarter to the different light-stations, on inspection duty, replaced 41 buoys, changed 150, painted 259, and established, replaced, and renovated 16 beacons, 2 spindles, and 6 tripods. She landed at the different stations 120 tons of coal, rations, and fuel for the keepers, and the crew did thirty-five days' work at the buoy depot. In doing this she steamed 12,491 miles and consumed 914 tons of coal.

The Columbine.—By act approved August 30, 1890, an appropriation of \$95,000 was made to build a steam tender for duty in the thirteenth light-house district. She is being built at Cleveland, Ohio, and according to the contract will be finished during March, 1892.

FOURTEENTH DISTRICT.

The fourteenth district extends on the Ohio River from Pittsburg, Pa., to Cairo, Ill., 966 miles; on the Tennessee River, 267 miles; and on the Great Kanawha, 73½ miles; in all, a distance of 1,307 miles, and embraces all the aids to navigation within these limits.

Inspector.—Commander Charles McGregor, U. S. Navy.

Engineer.—Lieut. Col. William E. Merrill, Corps of Engineers, U. S. Army.

In this district there are—

Fixed post-lights	494
Floating post-lights.....	35
Steamer <i>Goldenrod</i> , for supply and inspection.....	1

The following changes were made in the lights during the year:

Number of lights discontinued during the year (post lights)	2
Number of lights established during the year (float lights).....	0
Number of lights reestablished during the year (post lights)	10

LIGHT-STATIONS.

A number of new lights are needed, but the appropriation was so small that they could not be established this year. Still, a gradual increase in the number of lights has been made, and, during the year just ended nine new ones were placed. Applications are occasionally received from pilots, business men and towboatmen for the establishment of more lights. In a few instances reports were made by keepers that their lights had been interfered with in various ways; sometimes a lantern was stolen; or one taken down during the night, for a little time, by fishermen or people passing in boats. But no detection has yet been made in any case, though the keepers have strict orders to use every effort to locate the offender, if possible.

INSPECTION, PAY, AND SUPPLY TRIPS.

Three inspection and supply trips were made during the year. Each station was visited on each trip, except during the spring inspection, when, on account of low water on a falling river, the tender could only get to about 30 miles from Pittsburg. During the last trip each keeper was supplied with enough oil and other necessaries to last until November. Each keeper was paid up to date. The river was very high several times during the winter and early spring, but did not reach so high a point at any time as was reached last year. But the rise was sufficient to wash out many light-posts, all of which were replaced. The river was unusually high during the spring months. It has not fallen sufficiently yet to show what will be the channel for the ensuing year, in certain

Fourteenth District.

portions of the Ohio River between Evansville and Paducah shifts almost every year after high water. The whole light-triet is in such order that the pilots speak of it in terms of c tion.

KEEPERS.

As a general thing the keepers have been attentive to th and those who were reported for having lights out have show cases, that it was unavoidable. .

LISTS OF LIGHTS.

The pocket edition of the List of Lights on the Western popular amongst pilots and masters of steamboats, and more made for copies of it than for copies of the large edition.

TENDER.

The Goldenrod.—A number of changes and improvements in this steamer. The wheel was staggered to lessen the str tion. The result showed a very great improvement in all th parts of the boat, especially in the boat's office, the captain's the pilot house. In deep water the vibration in those place almost disappeared. In the after parts of the boat some re vibration was made, but the effect was not nearly so mark changes were made in the valves of the machinery at the s and in other parts of the engine, resulting in an increase o from a knot to a knot and a half an hour, and a reduction, i sumption of coal, of about a ton per day. Boats meeting on before these changes were made, which could either hold thei the *Goldenrod* or pass her, have since been left behind ea tender will hereafter be heated by hot water instead of ste distance traveled by the *Goldenrod* was 7,842 miles during In doing this she consumed about 879 tons of coal, and 18,6 of oil were distributed to keepers.

FIFTEENTH DISTRICT.

The fifteenth district extends on the Mississippi River from the head of navigation to Cairo, Ill., on the Missouri River to Kansas City, Mo., and on the Illinois River from La Salle to its mouth, being in all a distance of 1,588 miles, and embraces all the aids to navigation within these limits.

Inspector.—Commander Charles S. Cotton, U. S. Navy, until November 30, 1890; since then, Commander William C. Wise, U. S. Navy.

Engineer.—Lieut. Col. Charles R. Suter, Corps of Engineers, U. S. Army.

In this district there are—

Fixed post-lights	}	501
Floating post-lights		
Steamer <i>Lily</i> , for supply and inspection		1

The light-stations were duly visited, and were found to be in good condition. The keepers generally are faithful and efficient. Much work was done in clearing trees and underbrush which obstructed the view of the lights. Many channels were sounded and numerous channel marks were erected.

The following is an exhibit of the work done during the year:

Lights established	67
Lights discontinued	19
Increase in number of lights during the year	48
Laborers keeping lights	321
Channel marks	82
Trees cut, of and exceeding 4 inches in diameter	1, 419
Acres of willows, cottonwood, brush, etc., cut and cleared	14½
Gallons of oil issued	14, 808½

From St. Louis to Cairo lights were kept burning all the year. Above St. Louis, and on the Illinois and Missouri rivers, lights were extinguished and lighted as navigation closed and opened. At the end of the last fiscal year, there were in the fifteenth light-house district 453 lights; at the close of this fiscal year, there were 501, an increase of 48 lights. On the Illinois and Missouri rivers, the number of lights remains practically the same. But few steamers ply on these waters, hence no extra lights were required. Lights on the Missouri are not exhibited above Rocheport, and the dangerous navigation on that river is such that it is not deemed prudent to risk the *Lily* more than is essentially necessary, and under most favorable conditions, to pay, supply, and put in order the stations. The shifting character of the channel is such that only steering lights can be used to advantage. The River Commission is now engaged in improving the channel to Kansas City. Should their efforts prove successful, more lights will be required.

Fifteenth District.

Although but few passenger and freight steamers ply on the Illinois, the Missouri, and the Mississippi above St. Louis, yet all aids to navigation on these rivers should be kept up to the highest standard. On the Upper Mississippi, where the rafting interests are the largest, navigation is hindered, and in some places made dangerous, by unwieldy rafts, often 300 feet wide and 600 feet long, which block the channel. In other places logs are turned adrift, filling the channel for 30 or 40 miles and rendering it almost impassable at times. This is, of course, detrimental to the other interests in the river. The rafts should be limited to a controllable size, and the practice of filling the channel with loose logs should be prevented. From St. Louis to Cairo and the South the river is open during the whole year. Its large and important commerce requires that the channel be kept clearly defined and lighted. It is hardly fair to compel vessels carrying immense cargoes of grain and passengers to stop and sound out their channels. This part of the district should be constantly patrolled. This service could be performed by a small light-draught steamer, with a crew of about 10 men complete. It would also be valuable for service on the Missouri River, and it would save the *Lily* much dangerous work. This would add somewhat to the expenses of the district, but it would add much to its efficiency. It is therefore proposed that there be built a small steam cutter, about 20 feet long, to cost not more than \$5,000, to act as a tender to the *Lily* for sounding in the strong current and reaching stations inaccessible to the *Lily*. It would add much to her efficiency and rapidity of work.

TENDER.

The Lily.—This steamer was repaired in the fall of 1890 at Mound City, Ill., when her hull was put in good order. She was then laid up with reduced crew in winter quarters at Paducah, Ky., but she resumed her duty as soon as navigation opened. New boilers were put in in April, which have proved to be satisfactory. Her electric plant was renewed. Steam heat was substituted for stoves, thus reducing largely dangers from fire. During the year thirteen pay, inspection, and supply trips were made. The *Lily* steamed 6,200 miles, consuming about 1,165 tons of coal, and 3 cords of wood during the year.

SIXTEENTH DISTRICT.

district extends on the Mississippi River from Cairo, Ill., to New Orleans, La., and on the Red River a distance of 8 miles, being in all a distance of 956 miles, and embraces all the aids to navigation within these limits.

Inspector.—Lieut. Commander Robert M. Berry, U. S. Navy.

Engineer.—Lieut. Col. Charles R. Suter, Corps of Engineers, U. S. Army.

In this district there are—

Fixed post-lights	338
Steamer <i>Joseph Henry</i> , for supply and inspection.....	1

There are in this district 338 post-lights cared for by 323 keepers—an increase of 18 lights and 12 keepers during the past twelve months. Petitions have been received from the St. Louis, Vicksburg, and New Orleans Pilots' Society requesting the establishment of some 22 more lights, but it is deemed that the present number is ample, considering the means at the disposal of the Board, for the needs of river navigation. The proposed sites of the additional lights asked for are in bends of the river and at distances from habitations. If they were established it would necessitate the employment of "camp light-keepers" at an expense of \$15 per month, at the minimum. This could only be done by an increased expenditure of some \$4,000 per year.

The condition of the light-stations and their outfits and the efficiency of the service rendered by the keepers are generally satisfactory. The number of complaints against keepers, for poor service (*i. e.*, "light not burning"), is smaller in a marked degree than that of the previous season, and undoubtedly in many instances is the result of atmospheric causes rather than willful negligence. The class of laborers engaged in attending the lights in this district being considered, their faithful performance of duty, amid the dangers and hardships entailed by the annual high water, which this year prevailed from February to May, 1891, is deserving of special commendation. Complete inspections of the district were made once in each quarter, as required by regulations, in addition to which a patrol trip was made from Memphis to bend of Island No. 66 in January, 1891. The following is an exhibit of the work done during the year.

Miles steamed.....	8,900
tations inspected, paid, and supplied.....	1,321
tations established and supplied	59
tations discontinued	41
tations moved	302
keepers discharged	104
keepers appointed	116
rees over 4 inches in diameter felled	3,402
aces of willows, brush, etc., cleared	26½
llons of oil issued to stations.....	15,380

Sixteenth District.**TENDER.**

The Joseph Henry.—This steamer was furnished with an entire new canvas roof and the smokestacks were repaired. The repairs to the hull, made under the personal supervision of the inspector, consisted in the renewal of about two-thirds of the planking on the starboard, one-half on the port side, and two planks in the bottom of the hull, 8 squares of decking, 24 top timbers, 14 futtocks, 2 wheel fenders, 2 trusses at the end of the bridge trees, and the sheet-iron sheathing on the bow, and calking the entire hull. Two new steam feed-water heaters were also installed. The *Joseph Henry* during the year steamed 8,900 miles, conveying the inspector on four regular inspection tours over the entire district and one patrol trip, consuming 1,062 long tons of coal, being about one hundred and thirty-two days under steam.

CONCLUSION.

In concluding this report, the Board takes pleasure in stating that each of the sixteen light-house districts into which the establishment is divided is in good working condition.

All of which is respectfully submitted.

JAS. A. GREER,

Commodore, U. S. Navy, Chairman.

GEO. W. COFFIN,

Commander, U. S. Navy, Naval Secretary.

F. A. MAHAN,

Captain of Engineers, U. S. Army, Engineer Secretary.

The SECRETARY OF THE TREASURY.

REPORT OF THE LIGHT-HOUSE BOARD, 1891.

APPENDIX No. 1.

**RELATIVE TO THE TENDERS LILAC AND COLUMBINE, AND THE
LIGHT-VESSELS NOS. 51, 52, 53, AND 54, NOW BEING
BUILT BY THE LIGHT-HOUSE ESTABLISHMENT.**

THE LILAC AND THE COLUMBINE.

MATERIAL OF HULL.

The material is to be Siemens-Martin mild steel, and it shall satisfactorily stand the tests adopted by the Light-House Board.

DIMENSIONS.

	Ft.	In.
Length over all.....	155	0
Length from inside rudderpost to inside stem	145	0
Beam molded	26	6
Depth of hold from top of beam to top of keel plate	15	2
Depth of hold from top of beam to top of double bottom	12	4

GENERAL DESCRIPTION.

These vessels will be built each with a double bottom, constructed as per plan and specification, extending from frame No. 18 to frame No. 59.

DOUBLE BOTTOM.

The vessel will be fitted with a double bottom, extending from frame No. 18 to frame No. 59, constructed as shown on plans. Inside height of this double bottom, in the clear between plates amidship, will be 34 inches. The vertical center keel plate will run from end to end of the vessel, tapered forward and abaft the double bottom, to the height of the keelsons at these places; it will form the keelson and extend down to the skin of the vessel for three frame spaces, the floor plates on those frames being cut and securely riveted to the center keel-plate by angles 3 by 3 inches by 6 pounds. The side keelsons or girders will also run continuously, the floor plates and brackets between the girders being cut. The frames in the double bottom will be run continuously from center plate to the height given under heading "Frames." The reverse bars shall be cut between the girders and at the margin plate, where they will be dispensed with for a sufficient distance to allow the margin plate to be properly worked in, and to make the double bottom water-tight at the sides or bilges. As a compensation for cutting of the reverse frames at the side, there shall be put in doubling frames, same size as the ordinary frames, riveted back to back to frames proper. The lower and upper angles connecting the vertical keel plate to the inner and outer skin shall be continuous. The lower angles connecting the girders to the top of the vessel shall be clips, and those connecting the girder to the top plating shall be continuous. The floor plates under engine room shall be solid plates lightened by holes and manholes, one floor plate on each frame. Every second floor under boilers shall be built as specified for engine floors, and every second floor plate shall be built similar to these, with the exception that triangular brackets be used instead of solid plates lightened by holes. The arrangements of floors under engine boilers to be modified to suit engine and boiler foundations. This double bottom shall be divided into four separate water-tight and independent compartments, each

provided with a sufficient number of manholes properly constructed and so located that access can be had at all times to every compartment for cleaning and other purposes.

WATER-TIGHT COMPARTMENTS.

There will be seven water-tight bulkheads dividing the parts of each vessel above and forward, and abaft the double bottom, into eight water-tight compartments. All water-tight compartments in any part of the vessel to be provided with effective appliances for draining and emptying. The compartments denominated "trimming tanks" to be provided with appliances for filling and sounding and for the escape of air. The vessel will be built with a flat plate keel in double thicknesses and provided with an extra protective keel, constructed as shown on plans, also with an outside bilge keel on each side of the vessel, constructed as shown, and extending for about 70 feet.

STEAM STEERING GEAR.

The vessel shall have a steam steering gear of the Joseph P. Manton's of Providence, R. I., pattern; the engine shall be fitted complete with drum; hand steering and steam steering wheels of proper size and neat finish; all chains, wire rope blocks, and fairleads shall be supplied and fitted; the whole shall be arranged in the most convenient manner ready for actual use for steering by hand or by steam and to the satisfaction of the representative of the Light-House Board.

RIG AND EQUIPMENT.

The vessels will be rigged as two-masted schooners, with pole topmasts, gaffs, and derrick booms. Each will be supplied with a steam windlass, steam hoisting engine and the best appliances for handling anchors, buoys, and cargo, or any other purpose required by the service.

ELECTRIC LIGHTS.

The steamers are to be fitted with an electric plant for operating a search light and for illuminating all parts of the vessels.

MOTIVE POWER.

There will be for each steamer one right-handed cast-iron screw propeller, about 9 feet 4 inches in diameter and of suitable pitch, driven by an inverted-cylinder surface-condensing, fore-and-aft compound engine; the cylinders to be 22 and 14 inches in diameter, with a stroke of 30 inches. The steam will be furnished by two cylindrical single-ended boilers, 10 feet 8 inches in diameter, and 10 feet 9 inches long, each fitted with corrugated furnaces.

TESTING MAIN AND DONKEY BOILERS.

When the boilers are ready and before being lowered into the vessel, a hydrostatic pressure of 165 pounds per square inch by gauge shall be applied; all developing leaks shall be made tight carefully and effectually. Should rivets or socket bolts show such leaks as in the opinion of the representative of the Light-House Board would necessitate the cutting out of such rivets or bolts, this shall be done, the holes shall be made true, if necessary, and new rivets or bolts fitted. The hydrostatic test shall be continued until no leaks can be detected and until the result is entirely satisfactory.

These tests finished, the boilers shall be subjected to a steam pressure of not less than 40 pounds per square inch, continued long enough to satisfy the representative of the Light-House Board that the boilers are in absolute working order under the requirements of the contract and specifications, whereafter the boilers may be placed in the vessel.

provided with a sufficient number of manholes properly constructed and so located that access can be had at all times to every compartment for cleaning and other purposes.

WATER-TIGHT COMPARTMENTS.

There will be seven water-tight bulkheads dividing the parts of each vessel abaft and forward, and abaft the double bottom, into eight water-tight compartments. All water-tight compartments in any part of the vessel to be provided with effective appliances for draining and emptying. The compartments denominated "trimming tanks" to be provided with appliances for filling and sounding and for the escape of air. The vessel will be built with a flat plate keel in double thicknesses and provided with an extra protective keel, constructed as shown on plans, also with an outside bilge keel on each side of the vessel, constructed as shown, and extending for about 70 feet.

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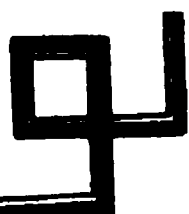
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Commander, U.S.N.
Naval Secretary.





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The boilers (main and donkey) shall stand all tests and shall be provided with all fittings, valves, instruments, and appliances for safety, etc., prescribed by United States law and the rules and regulations of the Board of Supervising Inspectors of Steam Vessels.

TRIAL TRIP.

In addition to the necessary trials of the machinery at the dock a trial trip is also to be made of about twelve hours' duration, or as may be directed by the Light-House Board, at the expense of the contractor, and the engine must develop 600 indicated horse power when the engine is making 110 revolutions per minute, with a coal consumption of $2\frac{1}{4}$ pounds per indicated horse power, and steam, per gauge, at 100 pounds pressure per square inch. All bearings, journals, crank pins, and other parts of the engine to show no tendency to heat or grip, but to run smoothly, the engine to pass its centers without shock or noise. The machinery must work on this trial trip to the entire satisfaction of the representative of the Light-House Board, and if any defects should develop on the trial, subsequent trials, at the expense of the contractor, as described above, will be made until every part of the machinery has been proven to be in accordance with the requirements of these specifications, to the satisfaction of the Light-House Board.

provided with a sufficient number of manholes properly constructed and so located that access can be had at all times to every compartment for cleaning and other purposes.

WATER-TIGHT COMPARTMENTS.

There will be seven water-tight bulkheads dividing the parts of each vessel above, and forward, and abaft the double bottom, into eight water-tight compartments. All water-tight compartments in any part of the vessel to be provided with effective appliances for draining and emptying. The compartments denominated "trimming tanks" to be provided with appliances for filling and sounding and for the escape of air. The vessel will be built with a flat plate keel in double thicknesses and provided with an extra protective keel, constructed as shown on plans, also with one outside bilge keel on each side of the vessel, constructed as shown, and extending for about 70 feet.

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and donkey) shall stand all tests and shall be provided with all implements, and appliances for safety, etc., prescribed by United States rules and regulations of the Board of Supervising Inspectors of

TRIAL TRIP.

Necessary trials of the machinery at the dock a trial trip is also twelve hours' duration, or as may be directed by the Light-House Board, at the expense of the contractor, and the engine must develop 600 indicated horsepower when the engine is making 110 revolutions per minute, with a $\frac{1}{2}$ pounds per indicated horsepower, and steam, per gauge, at 150 pounds per square inch. All bearings, journals, crank pins, and other parts must show no tendency to heat or grip, but to run smoothly, the machinery must work on this trial without shock or noise. The machinery must work on this trial to the satisfaction of the representative of the Light-House Board, and develop on the trial, subsequent trials, at the expense of the contractor, as prescribed above, will be made until every part of the machinery is in accordance with the requirements of these specifications, to the satisfaction of the Light-House Board.

LIGHT-SHIPS NOS. 51, 52, 53, AND 54.

MATERIAL.

The material in the hulls to be iron, and in the boilers steel, and shall stand satisfactorily the tests adopted by the Light-House Board.

DIMENSIONS.

	Ft.	Ins.
Length over all	118	10
Length from inside of rudderpost to inside of stem	110	0
Beam, molded	26	6
Depth of hold from top of beam to top of keel	14	6

These vessels are to be fitted with compound engines, steam whistles, steam windlasses and propellers, so that steam can be used by each vessel to blow her whistle, get her anchors, hoist her lanterns, etc., and get to and from her station with her own steam.

The hawse hole is to be forged into the stem in order that the vessels may ride more easily and to avoid the use of a bridle.

GENERAL DESCRIPTION.

The vessels will be built of iron to stand the tests specified, constructed as per plans and specifications. There will be four main bulkheads extending up to the main deck, built thoroughly water-tight. The vessels will have a bar keel and a sternpost forged solid with the rudderpost, and arranged for propeller shaft in the usual way, and as shown on plans. All plates in the shell of the vessels, the bulkheads, bulwarks, etc., shall be machine planed, and no other method of fairing the strakes or preparing edges for calking will be allowed. The plating will be run in inside and outside strakes, perfectly fair, and smoothly fitted up and riveted. The vessels will be provided with one outside bilge keel on each side of the vessel, extending for about 55 feet, constructed as shown on plans, and the run of these keels shall conform with the natural run of the water when the vessel is in motion.

Under the main deck, commencing aft, will be located storeroom, cabin, with four staterooms, coal bunkers, engine and boiler room, crew space with ten berths, lockers, wardrobes, tables, etc., pantry, oil room, sail room, and the forepeak will be fitted up as a storeroom with necessary lockers and shelves. Under lower deck, forward, will be located water tanks, chain lockers, fore hold, and a storeroom for paint, oil etc. On the main deck aft will be placed steering gear, skylight, and companion way for cabin, and the main-deck house consisting of a lantern room, pump and fog whistle machinery room, and galley. Forward of this house, and under the forecastle deck, will be located a steam windlass with elastic chain stoppers, and lockers, as shown on plans. On the forecastle deck will be located a lantern house, hoisting engine, bell, etc., and on top of the main-deck house will be placed a steam fog whistle and a hoisting engine; both the top of the deck house and the forecastle deck will be surrounded by a strong and neatly built iron railing. On the main deck will also be located two boats, necessary ringbolts, bitts, chocks, fairleads, scuppers, two hardwood stairs leading to the forecastle deck, and all other fittings for all purposes required by the service.

The vessel will be rigged with two masts and trysail-masts arranged as shown on plans.

STEM.

The stem will be forged with an eye similar to a common sternpost in single propeller vessels; this eye or hub will be inclined as shown on plans. The stem is to be of the best hammered iron, 7 by 1½ inches, and provided with an eye and hub of proper dimensions for the hawse pipe.

BULKHEADS.

There will be four bulkheads, arranged as per plan, and built thoroughly watertight; they are to be tested by a hydrostatic pressure not less than that equal to a head of water of 16 feet. The bulkheads shall be fitted with patent radiating stiffeners, the distance between the stiffeners decreasing toward the bottom and also toward the center line of the vessel. The plates shall therefore not be increased in thickness in the lower part of the bulkhead, but be of a uniform thickness, weighing 8 pounds per square foot.

HAWSE PIPES.

There will be two cast-iron hawse pipes, with warped flanges of semicircular form at the outboard and inboard ends, fitted in place, as shown on drawings, or as will be necessitated by the location and construction of the windlass; the hawse pipes are to be secured in place in a substantial and neat manner, and are to be properly proportioned to suit the size of chain and stand the shocks of the cables paying through them.

WINDLASS.

Each vessel will be furnished and fitted by the contractor with an iron steam pump brake windlass of either of the following patterns: The American Ship Windlass Company pattern; the Joseph Manton, Providence, R. I., pattern, or Bath Iron Works pattern, and capable of doing the work required efficiently by steam or hand power. The windlass will have three wildcats as shown on plan, two wildcats for two 2-inch chains, and one for 1½-inch chain; also two winch heads of proper dimensions; the pump brake will be arranged so as to be worked by hand below the fore-castle deck on the main deck. All pipes and connections from boilers and all necessary fastenings and fittings to be furnished and fitted in place by the contractor in complete working order, satisfactory to the representative of the Light-House Board.

Elastic chain stoppers of suitable dimensions, located as per plan, will be furnished, fitted, and properly fastened. Suitable wrought-iron pipes of about 12 inches diameter for leading the chains to the lockers are to be fitted and fastened in place.

ENGINE AND BOILERS.

There will be one right-handed, two-bladed, cast-iron screw-propeller of about 6 feet diameter and suitable pitch, driven by a compound surface-condensing vertical two-cylinder engine, the cylinders to be 14 and 24 inches in diameter, and a stroke of 16 inches.

There will be two cylindrical single-ended steel boilers of the Scotch type, 8 feet in diameter and 9 feet long, provided with a Fox's patent corrugated furnace, 14 inches diameter, in each boiler. Also a donkey boiler, 7 feet 3 inches in height, 14 feet 6 inches in diameter. There is to be furnished and fitted in place one horizontal, non-condensing engine, about 5 inches diameter of cylinder and 6 inches stroke, with properly attached machinery for operating the steam whistle; also one Ward's No. 3 distilling apparatus, with necessary evaporator, filter, pumps, etc., all to be arranged as shown on plans and as will hereinafter be described and specified.

TESTING OF MAIN AND DONKEY BOILERS.

When the boilers are ready and before being lowered into the vessels, a hydrostatic pressure of 150 pounds per square inch by gauge shall be applied, and all developing leaks shall be made tight carefully and effectually. Should rivets or socket bolts show such leaks as in the opinion of the representative of the Light-House Board would necessitate the cutting out of such rivets or bolts, this shall be done; the holes shall be made true if necessary, and new rivets or bolts fitted. The hydrostatic test shall be continued until no leaks can be detected, and until the result is entirely satisfactory.

These tests finished, the boiler shall be subjected to a steam pressure of not less than 40 pounds per square inch, continued long enough to satisfy the representative of the Light-House Board that the boilers are in absolute working order under the requirements of the contract and specifications, whereafter the boilers may be placed in the vessels.

WHISTLE.

The whistle will be 12 inches diameter of bell, with double-bent steam valve for admitting and shutting off steam. The lower end of the valve will have a suitable flange for fastening to the upper head of steam receiver, as shown on drawing.

STEAM ENGINE AND WHISTLE MACHINERY.

There will be furnished and fastened in place, complete and ready for operation, one horizontal, non-condensing steam engine about 5 inches diameter of cylinder, and 6 inches stroke, with a governor of approved pattern, fully suitable for the service; the maximum number of revolutions will be about one hundred and twenty per minute. Necessary valves and steam pipes to be arranged as indicated on plans, and around the foundation on deck will be fitted heavy sheet lead to receive all oil and drippings of water. The engine frame will be arranged for attaching the machinery for operating the steam whistle. This machinery will consist of a composition screw or worm wheel having about one hundred and twenty teeth, $\frac{1}{4}$ -inch pitch and 2-inch face. On the same shaft which carries the worm wheel will be a cast-iron cam wheel about 20 inches diameter, upon which brass cams of proper length are to be fastened. These cams work against a small composition roller, which is fastened in the middle of the length of a wrought-iron lever about 32 inches long; one end of this lever is stationery as a fulcrum, and at the other end is attached a rod one-half inch in diameter, connected at the upper end to the bell crank which operates the whistle valve. The whole to be erected under the supervision and to the satisfaction of the representative of the Light-House Board.

DISTILLING APPARATUS.

The distilling apparatus, placed where directed, will consist of one Baird No. 3 evaporator, No. 3 condenser, aëerator, and filter; also a circulating pump, feed pump, drain pump, and salinometer pot.

TRIAL TRIP.

In addition to the necessary trials of the machinery at the dock, a trial trip is also to be made of about eight hours' duration, at the expense of the contractor, and all the machinery must work on this trial trip to the entire satisfaction of the representative of the Light-House Board. If any defects should develop on the trial, subsequent trials, at the expense of the contractor and as described above, will be made until every part of the machinery has been proven to be in accordance with the requirements of these specifications.

All bearings, journals, and other parts of the engine when working under a pressure of 100 pounds per square inch must show no tendency to heat or grip, but to run smoothly without shock or noise.

Light-Ship No. 51, which is to be placed off Cornfield Point in Long Island Sound, is to show an electric light.

Light-Ships Nos. 52, 53, and 54 are to be stationed respectively at Fenwick Island Shoal off the coast of Maryland, Frying-Pan Shoal off the coast of North Carolina, and Martins Industry Shoal off the coast of South Carolina, and are to show reflector lights similar to those now in general use on our coasts.

STEAM AND ELECTRIC PLANT FOR LIGHT-VESSEL NO. 51.

[With reference to this vessel only.]

Vessels Nos. 51, 52, 53, and 54 will be built and constructed in accordance with the plans marked No. 1 to No. 6 with the following modifications for Light-Vessel No. 51: The electric lights will be carried as marked on plan A; the lantern houses will be dispensed with, and the after part of the deck house will be enlarged as shown on plan B to accommodate electric plant; plans A and B illustrate the necessary modifications in this vessel and are laid down solely for this purpose. The lights and the metal fitting for suspending them, also the electric plant, *will be furnished and fitted by the Light-House Board*; all other fittings either specified or shown, shall be furnished, fastened, and put in complete working order by the contractor, that is, the contractor shall deliver this vessel as complete in all respects and in all its details as vessels Nos. 52, 53, and 54, ready for actual service with exception of the electric lights and the dynamos with their engines.

ENGINES.

Two horizontal high-speed engines with automatic cut-off governor, capable of developing eight horse-power at normal speed with seventy pounds of steam, cutting off at a $\frac{1}{2}$ stroke. Governor to control speed accurately and to be capable of adjustment to enable speed to be varied 20 per cent above or below the normal. Engines will have no outboard bearing and will have cast-iron base complete ready to set on deck at floor level.

DYNAMOS.

The two dynamos are to be compound wound, and to be of at least 60 amperes capacity, with an electro-motive force of about 110 volts at terminals of machine; they are to be automatically regulated, so that three-fourths of the lamps may be extinguished with safety without material change of speed. They must not spark and must not require the brushes to be shifted to accommodate change of load. Their commercial efficiency must be at least 80 per cent. The engines and dynamos are to be so located that, with the Evans friction cones, either engine can run either or both dynamos. The dynamos will therefore be furnished with sliding bed-plates, so that they can be quickly thrown in or out of action.

ACCESSORIES TO DYNAMOS.

Resistances or other suitable devices controlled by hand must be provided with each machine, so that the current and the electro-motive force are at all times under perfect control. A connection board arranged for four independent circuits, with connections for testing instruments in each circuit and switches for throwing in either dynamo, with safety strips for each circuit, is to be provided. One ammeter and one voltmeter, Ayrton & Perry spring pattern, of capacity adapted to the plant, are to be provided.

FLASHING DEVICE.

Attached to the engines or dynamos must be a device for alternately opening and closing, at regular intervals, the circuits to the lights at the mastheads; this device must be so made that the lengths of the intervals may be varied from five seconds to twenty seconds at will.

LAMPS AND FIXTURES.

Eight 100 candle-power lamps with keyless sockets are to be furnished; the carcasses of these lamps are to be coiled in a spiral according to the sample which will

be supplied to the contractor. Twenty 16 candle-power lamps, with key sockets, brackets, shades, and shade holders; safety strips, are to be furnished and placed in position in the light vessel where it may be directed. All lamps must last at least 600 lamp hours, must be interchangeable in their sockets, and each lamp must be marked with its candle-power and resistance when cold, and must not vary in resistance more than one ohm from a given standard.

EXTRA PARTS TO BE FURNISHED IN ADDITION TO THOSE PREVIOUSLY MENTIONED.

Four dynamo brushes, ten 100 candle-power lamps, twenty 16 candle-power lamps, four keyless sockets for 100 candle-power lamps, ten key sockets for 16 candle-power lamps, one spare armature, six shade holders, six shades.

WIRING OF LIGHT-VESSELS.

The double wire system of conductors must be employed. Commercial wire of the best quality is to be used throughout.

Plate A.

G



Geo. Coffin
Commander, U.S.N.
Naval Secretary.

2

Plate 6.



Office
er, U.S.N.
Secretary.

REPORT OF THE LIGHT-HOUSE BOARD, 1891.

APPENDIX No. 2.

REPORT

UPON THE

ELECTRIC BUOYS IN GEDNEY CHANNEL, NEW YORK HARBOR,

BY .

C. H. WEST,

LIEUTENANT-COMMANDER, UNITED STATES NAVY,

ASSISTANT TO THE INSPECTOR OF THE THIRD LIGHT-HOUSE DISTRICT,

TO

HENRY F. PICKING,

CAPTAIN, UNITED STATES NAVY,

INSPECTOR OF THE THIRD LIGHT-HOUSE DISTRICT.

ELECTRIC BUOYS IN GEDNEY CHANNEL, NEW YORK HARBOR.

**U. S. GENERAL LIGHT-HOUSE DEPOT,
OFFICE OF U. S. LIGHT-HOUSE INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., August 1, 1891.**

Capt. H. F. PICKING, U. S. Navy,

Inspector of the Third Light-House District, Tompkinsville, N. Y. :

SIR: In obedience of your verbal order I have the honor to make the following report as to the condition and the efficiency of the plant for the six electric buoys in Gedney Channel, near Sandy Hook, entrance to New York Lower Bay.

This plant has been under my observation since November, 1890, when I reported for duty at this depot.

The past winter of 1890-'91 was very severe in its treatment of the buoys, lamps, and their cable connections, as the weather was more tempestuous than during the two previous winters of 1888-'89 and 1889-'90.

There was some floating ice, but not sufficient to put the buoys to an extreme test as to damages which might be caused by ice alone.

Only such a cold winter as that of 1874-'75, when the three light-vessels moored at Bartlett Reef, Cornfield Point, and Stratford Shoal were carried from their moorings by ice and set adrift on Long Island Sound, would subject the electric buoys and their lamp attachments to a crucial test as to heavy floating ice.

Owing to the unusually heavy seas on Gedney Bar many of the incandescent lamps had but short life, and it was an incident of every two or three days during the stormy months of December, January, and February, to send a tender from the depot to Sandy Hook for the purpose of renewing the electric lamps or remedying slight defects of the general plant.

There were, however, always sufficient lamps in effective operation to guide a vessel over the bar.

The pilots have acquired such confidence in the system that even if two lamps are extinguished at one time the remainder serve the purpose of lighting a vessel through Gedney.

Another reason for a short life of the lamps during the winter was the fact that the output of lamps by the Edison Company during the early winter was inferior in quality to their customary standard. This complaint of bad quality was not confined to this office, but extended to commercial circles as well.

I am informed that a British steamer, which lit up with their incandescent lamps at the dock in New York, did not have one lamp in efficient operation upon passing out to sea a couple of hours later.

It is, however, fair to state that the company did not demand payment of this office for lamps not up to the standard.

It is not positively known as to where the defects lay in the lamps, as they passed the usual test upon receipt. But as their life mostly went out by breakage of the filament, it is supposed that the wide-spread failure at that season was due to inferior quality of the carbon or its imperfect preparation.

During the winter the defects of the lamps were carefully watched by this office, and the Edison Company endeavored to eliminate their errors one by one as they exposed themselves.

In this progression the insulation of the wires was finally carried quite through the plaster of Paris at base of lamp, thus preventing short circuiting when the plaster dampened on exposure to sea water.

Improvements were also made in the junction of the platinum wire with the carbon. The current was increased to about 4 ampères, giving greater brilliancy with the same life.

The larger spiral filament has been retained, but inclosed in a 5-inch bulb in place of the smaller oblong bulb formerly in use.

The 5-inch globe is found to heat very much less than the oblong pattern, and thus not be so liable to crack when coming in contact with cold sea water during winter.

The single-conductor cable (pattern A) first made for the system has shown great weakness at the heel of the buoy by the turning and thrashing of the buoy in a seaway. This cable is not only liable to chafe out at the heel, but to unlay the armor for some 30 to 40 feet beyond.

As new single-conductor cable had to be ordered to supply deficiencies, an effort was made in the specifications to render it stronger and generally more efficient.

For this single-conductor cable the Bishop Gutta-Percha Company furnished 450 feet, as per specifications (C pattern) herewith appended.

The second armor on this cable protects the interior more fully from the abrasion of sand, small pebbles, and shells, and prevents the interior cable from unlaying. At the same time the cable is more pliable and does not kink spontaneously, as is the case with the two cables first supplied (patterns A and B).

It is at present the practice to lay the A cable along the score cut in the buoy, as this cable is lighter and gives the buoy more buoyancy.

The C cable is spliced to the A cable inside the buoy, about 5 feet from the heel, thus throwing the strain of twisting on the heavier C cable outside the buoy. The C cable extends about 50 feet from the heel of the buoy, and is then spliced to the old A cable, which leads to the junction box.

During the past winter it has fortunately not been necessary to underrun either of the large three-conductor cables for purpose of repairs, but from the condition of the "red" cable (that is, the north cable, supplying the red-lighted buoys), as disclosed during the month of July, 1891, it appears that it has been rapidly deteriorating for some time past.

A special report of this deterioration has this week been made to the Light-House Board by the inspector of the district, and as no further facts are at present known, that report is here quoted in part for the purposes of the annual report of the Board.

I have the honor to report to the Board that at about 11:45 p. m. of Monday, July 20, 1891, the three electric buoys, Nos. 2, 4, and 6, on the north side of Gedney Channel, entrance to New York Lower Bay, were extinguished simultaneously.

This simultaneous extinction indicated that the fault probably lay in the main (three-conductor) cable, and that it was not a local fault due to imperfection in any single-conductor cable or buoy.

On the following day, Tuesday, July 21, work was begun with the tender to locate the trouble. After a week's hard work of twelve hours daily, including Sunday, the various faults of the cable were located and repaired, and the buoys relit on the night of Tuesday, July 28.

During the progress of repairs the north cable was found to be in a process of serious deterioration, imperiling the existence of the plant as to red-lighted buoys Nos. 2, 4, and 6.

I send herewith a piece of chart showing graphically the location of the worst faults repaired during the week's work.

The tender first went to the vicinity of the junction box near No. 6 buoy, position No. 1, where two very bad kinks in the cable were found. Eight armor wires in each kink were broken and the cable more or less defective for 60 feet.

In many places the wires of the outside armor had become so open that the tarred hemp, served over the inner core of gutta-percha, hung outside from 1 to 3 inches. The gutta-percha was, therefore, exposed to injury and after a slight abrasion would, of course, cause a "ground" to the copper wires and a short circuit.

This length of 60 feet was so imperfect that it was cut out and the ends of the cable hauled together and spliced.

A fault was still found towards the shore. The cable was therefore underrun from position No. 1 to position No. 2, where the cable was found broken in two. The two ends were buoyed on the boat and tests for insulation made towards the buoys and shore.

Towards the buoys the insulation was good, while towards shore a fault was still present.

As the exterior armor was somewhat pitted about 100 feet from the beach, by the local action of the surf and sand, it was thought that the fault probably lay in that locality.

The cable was therefore cut as near the beach as it was safe to go in the surf (position No. 3) to test insulation.

The insulation was found perfect to the dynamo house, while faults still existed between Nos. 3 and 2. The cable was therefore respliced at No. 3.

The tender then returned to position No. 2 and underrun towards the shore.

Upon arriving at position No. 4 it was with the greatest difficulty that the derrick could raise the cable. It appeared to be held on the bottom by some great weight, as if a sunken wreck or great rock rested upon it. No obstruction, however, could be felt with the hand lead.

After much labor the cable was finally raised, and although the exterior armor appeared in good condition, it still showed faults.

Reducing the fault by elimination, it was finally traced to a length of about 75 feet. This was cut out, when the cable showed proper tests both ways, and the ends were respliced.

It is not known positively yet what caused the fault in this part, but it probably lies in the interior copper wires. The armor will be unlaid and the core carefully examined.

After resplicing at No. 4, the tender returned to position No. 2, and the insulation was found good both ways.

As the cable was badly damaged at position No. 2 by kinks and open armor, 200 feet were cut out as worthless, and 75 feet of good cable substituted.

After this fourth and last splice at position No. 2 the cable showed good insulation throughout, and the buoys were relighted that night.

When it is considered that from four to five hours are necessary to make one splice in the large cable, oftentimes in a heavy sea, with the spray breaking over the launch, the labor of examining the whole cable will be appreciated.

The cables have been in operation since November 7, 1888, or two years and eight months, during which period there has been trouble with faults in the south cable that supplying the white-lighted buoys, Nos. 1, 3, and 5.

There has been no trouble with the north cable up to the last week, when it developed so many weaknesses.

It now remains to be considered what causes these faults, kinks, and breaks, which render necessary such great labor and expense in repairs and endanger the existence of the plant itself.

There is only one answer to this query, and that is, the anchors of vessels casting

in that vicinity pick up the cables and exert such strain upon them that the cables either break or fly back in kinks after the strain subsides.

This is the experience on land telegraph lines. A few years ago, after a severe winter storm, a number of telegraph poles fell, and in so doing threw the loops of many wires across a railroad track. A passing train encountered these wires, and to clear them aside the locomotive was forced full speed ahead. After a tremendous tensile strain from the whole train, the wires finally broke and then flew into thousands of kinks and convolutions. The wires afterwards could not be restraightened and were cut out.

In the same way the tensile strain acts in a lesser degree on these two electric cables.

Then, again, when the cables were new I am told they had a tendency to spontaneously throw themselves into numberless kinks like new manila rope just taken from the coil.

When these cables once kink on the bottom it is almost impossible to straighten them out, and as a result of the angular strain the wires of the outside armor are broken.

Every care was taken to lay the two cables straight without kinks, but each time the cable is underrun to discover faults the slack caused by hauling twists itself into kinks at once.

The early part of the night of Monday, July 20, when the buoys went out, was somewhat foggy. About 11:45 p. m., when the fog cleared away, a Savannah steamer was discovered by the signal observer stationed at Sandy Hook to be apparently anchored just at position No. 2.

In all probability she let go her anchor there in the fog, and when raising, at about 11:45 p. m., fouled the cable and parted it, as subsequently found by the tender.

Numbers of schooners have been seen anchored within the lines of the prohibitory angle drawn from the Hook Beacon.

From my observation here I doubt if one master in twenty of these schooners ever sees a notice to mariners. If they do happen to be aware of the locality of cables at Sandy Hook I still further doubt if one of their masters would forego anchoring in that angle when any stage of tide or cant of wind rendered an anchorage convenient in that vicinity.

One day three pilot boats were seen anchored directly over the cables in an easterly blow, and these costly cables were probably doing sad service in keeping them from dragging.

When possible the masters of our tenders have expostulated with the captains of such vessels, but the only reply is a plea of ignorance as to the existence of the cables or their exact locality.

Anchors are the worst enemies this plant has had to contend with in the past and so they will be in the future.

After the serious impairment of the north cable as set forth above it is a question of what is to be done to preserve the integrity of the plant.

By underrunning nearly the whole length of the north cable it was seen that it is generally in very poor condition, almost verging on dissolution, especially between positions Nos. 1 and 2, and a little farther to the southward and westward, or as marked A-B on the chart.

To the westward of B towards the beach the cable is in fairly good condition, although within 100 feet of the beach it is badly pitted.

One fact is certain, and that is the north cable will have to be partly renewed with new cable at once.

The exact condition of the south cable is unknown, but it is reasonable to suppose that it is more or less in the condition of the north cable. They lie alongside of each other, and are exposed to the same vicissitudes of anchor flukes.

Its spontaneous tendency to kink renders it unreliable and short-lived.

During the past spring the Bishop Gutta-Percha Company made for the plant a one-conductor cable with two armors, which was pliant and showed no tendency to kink. The exterior armor, while affording an extra coat of protection to the interior core, at the same time rendered the cable more supple.

If, therefore, the Board decides on purchasing new three-conductor cable I would suggest that it be made on the double-armor principle. I am of the opinion that one new three-conductor cable, or 17,000 feet, should be ordered at once.

One-half of this can be expended in renewing the north cable between the points A-B, while the other half can be kept in water at the depot to renew such parts of the south cable as may show serious impairment.

In the problem of repairs we also have to consider the necessity, perhaps near at hand, of renewing more or less of the 2½ miles of single-conductor cable leading from the two junction boxes to the six buoys.

As the cables are under water and thus not accessible for frequent inspection it is the safest plan to regard the deterioration from the worst side and be fully prepared to meet it.

The making of these cables requires long periods of time, and cable must be on hand at the depot to meet sudden emergencies.

It was not thought last spring that the cables would deteriorate so rapidly that they would require partial renewal in less time than five years. A clause in the contract for these cables specified that the contractor should give, under bond, a guaranty for the proper performance by the cables of the required service for the period of five years from date of completion and delivery. A penalty was to be exacted from the contractor or his bondsmen of \$50 for each and every 1,000 feet of conductor in case of failure of cables, unless such failure was due to extraordinary mechanical injury.

I am of the opinion that the injury by anchors can only be classed under the head of extraordinary mechanical injury, and therefore no penalty can be demanded.

I am also of the opinion that no master of a vessel can be held legally responsible for anchoring over the cables and injuring them, as recent decisions of the courts are against the cables.

The following quotation from the Electrical Engineer of May 20, 1891, cites an instance of interest:

“Submarine cables laid in shallow water are often exposed to greater risks and rougher treatment than the great ocean cables which sometimes cost their owners a small fortune in repairs. Not long ago an ocean-going steamship in leaving her dock at Jersey City plowed up the soft bottom with her powerful propeller, and secured a costly and valuable catch in the shape of about a dozen submarine cables, which enmeshed themselves in the blades of the propeller so effectively that all the cables were torn asunder and the ship had to go into dry dock to clear her screw of the garlands of iron, hemp, and kerite, with which it had become embellished—not to say embarrassed. The learned judge who presided over the argument as to whether the telegraph company, which owned the cables, or the steamship company, which owned the inquisitive vessel, was the aggrieved party, decided in favor of the latter, holding that a harbor is to be kept free for navigation, and that a steamer is entitled to plow through mud as well as water, cables or no cables. If the cables were thought to be secure because they lodged in 2 feet of silt, why so much the worse for the cables, or rather for their owners. According to the learned judge, ocean steamers possess the right of way through the silt, even down to hard rock, and the waters of a harbor for purposes of navigation have no ‘bottom.’ This is no comfort for owners of submarine cables in harbors, but by way of adding insult to injury, the very practical suggestion was made that cables might be laid in a species of submarine trench, and thus be kept out of harm’s way when ocean steamers (or others) find it necessary to ‘take the ground.’”

I inclose herewith a copy of a newspaper paragraph relating to the appreciation in price of gutta-percha, which may be of interest:

[From New York Daily Times, April, 1891.]

"GUTTA-PERCHA IN DEMAND—THE PROGRESS OF ELECTRICITY DRIVING IT FROM THE MARKET.

"The projectors of the Guatemalan and Pacific cables are said to be confronted with a serious problem as to insulation. What they are to use to cover their long submarine wires is almost as important a question as were the original preliminary grants. They want gutta-percha, because that is the material always used in long-distance submarine insulation, and because there is no other substance that has yet been found to take its place. But the supply is so limited that an attempt to buy such a quantity as they will need would send the price from \$1.75 a pound, as it is now quoted, up to \$4 or \$5 a pound.

"Gutta-percha, like platinum, is a stuff that has increased in price as the use of electricity has become more and more general. Just as platinum has almost become the king of metals, so gutta-percha has become the king of insulators. It was very cheap a few years ago, but the increased demand has sent it up to \$1.75 a pound now, with a constant tendency to increase. The Guatemalan cable people, it is said, have proposed the use of caoutchouc to insulate their wires, and the rubber market, in consequence, has been expecting a boom.

"But experts say that while Pará rubber is a good insulating material under ordinary circumstances, it can not stand the forces that attack it at the bed of the ocean, and it is extremely improbable that the projectors of a great cable will try any such elaborate experiments with it as would be involved in a transocean line.

"Balata, which is neither gutta-percha nor rubber, but possessing many of the properties of the former, would be a good substitute for gutta-percha, it is said, if it could be found in sufficient quantities. There is also said to be a gum on the banks of the Orinoco which makes an insulating material almost as good as gutta-percha, but it is not found in commerce.

"Gutta-percha, which thus bids fair to be a more important article in the market than ever before, comes to us through England from the Malay Peninsula, India and China. Gutta, or, as it is variously written, gutah, gatta, gittah, gotta, is the Malayan term for gum, and percha is the name of the tree. The tree attains a height of from 60 to 80 feet, with a diameter of from 2 to 4 feet. The wood is soft, fibrous, spongy, and of a pale color, marked with black lines, these being the reservoirs of gutta-percha. The gutta as it flows from the tree is of a grayish hue, although the market product becomes almost black in its preparatory processes.

"The collection of gutta-percha generally takes place directly after the rainy season, as it is in the dry season that the gutta does not flow so readily.

"The yield of a well-grown tree of the best variety is from 2 to 3 pounds. The natives extract the gum by cutting down the tree at a height of 14 or 16 feet above the ground. Narrow strips of bark are then removed and are beaten by the natives to accelerate the flow of milk or gutta, which is received into hollow bamboos or in holes scraped in the ground. The next step in the process is boiling. This is conducted in a 'kwali,' or pan of iron, in which lime juice or cocoanut oil is mixed with the gum. When sufficiently boiled the gutta is pressed into molds.

"On arriving at the port of shipment the gutta before exportation undergoes examination and classification into parcels according to its quality. Nearly the whole product is then shipped to England, whence it reaches the United States in small quantities and generally of the poorest variety. Four-fifths of the entire product is used in making cables, and nine-tenths of it is handled in England. That which is exported to this country is oftentimes only the refuse from the British shops boiled over and remolded.

"The constant diminution in the supply of gutta-percha was explained by an importer yesterday in this way: If a Malay or Chinese wishes to plant pepper or anything else he burns down a portion of the forest, and when he has raised two or three crops he clears a new portion. Thus finely wooded spots become denuded of trees and covered with rank grass, rendering them unfit for further cultivation.

"Again, to obtain the gum the trees are cut down, none are planted to take their places, and the result is that in districts where percha trees once abounded only one or two can now be found. A writer in an eastern paper says that in twenty years over 90,000 piculs (of 133½ pounds each) of gutta-percha were exported from Sarawak alone, and that this meant the death of at least 3,000,000 trees."

The general condition of the plant on shore as to engines, dynamos, boilers, wires, and testing instruments is good.

The juniper (cedar) sticks from Norfolk, Va., are now known to be the most stable and serviceable buoys for the electric system, keeping the lanterns well above the sea.

The most trying situation for the lanterns and the incandescent lamps within is found to be a strong tide in one direction pressing the buoy down while a heavy sea runs contrary to the tide. The sea thus breaks over the head of the buoy and fills the lantern with salt water, which, if cold, is apt to crack the incandescent bulb heated by the filament. This is best exemplified in winter, when the sea of an easterly gale is running contrary to a spring ebb tide.

The highest work done in a month by the plant since its establishment was in November, 1890, when 101 vessels passed the bar, 67 coming in and 34 going out, or an average of 3.4 vessels each night.

The best test of the plant is shown by the confidence with which pilots bring in from sea vessels of the largest displacement and length.

Of course in passing the bar from seaward a vessel's departure is not so accurately determined as in going out to sea, and therefore the pilotage coming in is a more skillful task.

The monthly report of vessels passing the bar at night records as coming in the largest steamers plying to the port of New York, such as the *Etruria*, *City of Paris*, *Majestic*, *Fürst Bismarck*, *Umbria*, *La Champagne*, *Lahn*, *La Bourgogne*, *Germanic*, *Ems*, *Augusta Victoria*, *Teutonic*, etc.

The *City of Paris* and *City of New York* are of 10,500 tons register and the *Teutonic* and *Majestic* of 10,000 tons.

By a coincidence the *Teutonic* seems to arrive off Sandy Hook at night, as by the known record she has passed the bar at night coming in some six times.

Appended hereto is Table III, giving the draughts of the large steamers plying to New York.

That table shows the Cunard steamer *Etruria* to be generally the deepest-draught steamer passing the bar.

In the past two years and eight months the pilots have become so accustomed to the aid of the electric buoys that any temporary extinction of the lamps, rendered necessary at times by repairs to the cables, leads to a loud outcry on their part for a quick relighting.

It is to be regretted that the smooth working of the system should be interrupted and its very maintenance endangered by masters of vessels who are indifferent to a location of the cables when selecting anchorages.

Of course in fogs or a stress of weather the vessel's safety is of the first importance, but could the injuries to the cables by anchors be reduced to such conditions alone, the bad results might perhaps be accepted with fair grace. It is the unconcerned master of a vessel who never reads a notice to mariners and who is careless as to the location of the valuable cables that inflicts the most culpable damage.

I have been unable to ascertain positively up to date of writing which vessel completely severed the cable at the position marked No. 2 on the accompanying chart.

It is not probable that the cable was caught up from the bottom by a steamer's screw and so cut in two, as the cable lay in over 42 feet of water at that part of the South Channel.

Besides being parted by a vessel's anchor, only one other possibility remains as to this casualty.

It is within the range of chance that one vessel had entangled her anchor in the cable and was lifting the bight of the cable to clear the anchor. While the bight of the cable was thus lifted from the bottom a steamer might have passed close enough to the first vessel to have caught the bight in her screw and so cut it.

This might not occur once in fifty years, but such an accident will always remain a possibility with the cable system and a serious imperfection.

If a steamer so entangled did not succeed in parting the cable, but continued fouling it with every turn of the screw, it might lead to a catastrophe in those exposed waters.

As in the past, the intelligent care of the plant by Mr. W. L. Brown, ably supported by his assistants, Frank Wetterloo, J. T. Dixon, and Mark Pierce, has resulted in as an efficient maintenance of the whole installation as circumstances of weather and anchoring would permit.

Mr. G. H. Goddard, master of the tender *John Rodgers*, and Mr. E. C. Ruland, master of the tender *Gardenia*, have rendered valuable service in handling the long electric buoys and in underrunning cables to detect faults.

The *Gardenia*, by her handiness as a propeller and shape of hull, is particularly well adapted for work on the plant, and she has demonstrated her usefulness in the heaviest seas on the bar when an emergency did not permit an hour's delay in repairs.

Appended hereto are detailed descriptions of the cables thus far employed and proposed for future use.

Table I shows injuries to lamps; Table II the record of vessels passing the bar from the installation to July 1, 1891; Table III gives the draughts of various vessels plying to New York.

A chart is annexed showing repairs to the north cable in July, 1891.

Very respectfully, your obedient servant,

C. H. WEST,
Lieut. Commander, U. S. N.,
Assistant to the Inspector of the Third Light-House District.

Memorandum showing the composition of electric cables, Sandy Hook, already in use and one proposed.

A pattern (single conductor).—Conductor formed of seven copper wires No. 18, B and S, stranded, insulated with gutta-percha, $\frac{3}{16}$ -inch diameter, served with hemp, then armored with twelve wires, No. 9, B. W. G.

Of this pattern 14,170 feet were purchased at installation and 1,000 feet, August 25, 1890. In use from two junction boxes to each of the six buoys. Diameter, $\frac{1}{2}$ inch.

B pattern (three conductors).—Three conductors, each composed of seven wires, No. 18, B and S, stranded, insulated with three coats of gutta-percha to 0.29 of an inch. Served with tarred hemp and armored with sixteen wires, No. 6, B. W. G. Diameter $1\frac{1}{4}$ inches. 31,493 feet purchased at installation.

In use as two main cables from Sandy Hook to junction boxes.

C pattern (single conductor).—Conductor, seven copper wires, No. 18, B and S, stranded, insulated with gutta-percha $\frac{3}{16}$ -inch diameter, bedded with jute and armored with sixteen wires, No. 6, B and S. Wire extra galvanized.

Covered with tarred hemp and asphalt compound. Then outside a second armor of eighteen wires, No. 8, B and S. The inside layer of jute and second layer of tarre

hemp are reversed in their lay. The lays of the interior armor and exterior armor run in the same direction, rendering the cable more pliable. The exterior armor is drawn through a bath of tar.

Diameter, 1½ inches. Four hundred and fifty feet of this purchased in spring of 1891, and in use from heel of buoy for about 50 feet and then spliced to the old A pattern.

D pattern (three-conductor cable, proposed).—Three conductors, each seven copper wires, stranded, No. 18, B and S, insulated to 0.29 inch, gutta-percha. Three conductors stranded, served with hemp thoroughly saturated with tar. First armor eighteen wires, No. 5, B and S. Then served with hemp saturated with tar. Then run through a bath of tar. Then outside armor of a trifle softer metal, eighteen strands, No. 10, B and S. Metal extra galvanized. Cable again run through a bath of tar. Diameter about 2 inches.

TABLE I.—Showing injuries to lamps of the electric buoys in Gedney Channel, New York Bay, N. Y., during the year ending June 30, 1891.

Date of failure.	No. of buoy.	Date re-nued.	No. of hours ex-tin-guished.		Cause.	Remarks.
1890.			H.	M.		
July 3	4	July 4	8	57	Carbon broken.....	
4	5	July 4	0	14	.....do	
4	5	July 5	7	30	Defective lamp	
9	6	July 10	9	04	Carbon broken near platinum wire	
14	6	July 15	8	07	Carbon broken.....	
18	3	July 18	3	14	Platinum wire in lamp fused	
Aug. 6	6	Aug. 12	60	21	Broken cable	
14	6	Aug. 14	1	29	Short circuit in No. 6 buoy.....	
15	4	Aug. 16	10	12	Lamp broken in setting buoy.....	
16	4	Aug. 20	37	32	Defect in cable.....	Changed 50 feet of cable.
19	1	Aug. 20	10	22	Broken carbon	
21	5	Aug. 22	10	29	.....do	
Sept. 13	2	Sept. 13	2	54	Line wire broke at cable box.....	
20	2	Sept. 20	3	16	Carbon broken.....	
25	2	Sept. 26	10	58	Platinum wire burnt in lamp	
27	2	Sept. 28	12	06	Copper and platinum wires parted in lamp.	
30	3	Sept. 30	1	41	Wire corroded at shell of lamp.....	
Oct. 17	1	Oct. 18	16	22	Copper and plantinum wires parted in lamp.	Northwest gale.
24	2	Oct. 25	17	48	Cable box pole washed out; carbon broken.	Easterly gale.
Nov. 15	3	Nov. 17	27	47	Lamp carbon broken.....	
26	(*)	Nov. 26	0	1½	Short circuit in commutator of No. 1 machine.	No. 2 machine was started in 1½ minutes.
28	5	Nov. 29	9	18	Lamp carbon broken.....	
Dec. 2	6	Dec. 4	27	57	Broken carbon.....	Heavy easterly seas.
3	4	Dec. 4	13	13	Short circuit in wire.....	Do.
4	3	Dec. 4	5	43	Broken carbon.....	Do.
4	5	Dec. 4	1	38	.....do	Do.
16	2	Dec. 20	55	05	.....do	Do.
17	1	Dec. 20	43	30	.....do	Do.
17	3	Dec. 20	42	00	.....do	Do.
22	1	Dec. 22	6	00	Copper and platinum wires fused.....	
26	1	Dec. 27	14	45	Carbon broken.....	Heavy easterly seas.
26	3	Dec. 27	14	45	.....do	Do.
26	2	Dec. 27	14	45	.....do	Do.

*All six buoys.

TABLE I.—*Showing injuries to the lamps of electric buoys in Gedney Channel, New York Bay, N. Y., etc.—Continued.*

Date of failure.	No. of buoy.	Date renewed.	No. of hours extinguished.		Cause.	Remarks.
1890.			H.	M.		
Dec. 28	4	Dec. 30	29	25	Carbon broken.....	Heavy easterly seas.
1891.						
Jan. 2	6	Jan. 3	8	10	Lantern broken by passing vessel	Do.
10	3	Jan. 11	14	30	Copper and platinum wire parted.....	Heavy seas.
11	3	Jan. 13	28	29	Carbon broken.....	Do.
11	5	Jan. 13	27	47	Broken globe	Do.
12	6	Jan. 13	15	26	Carbon and platinum wire broken	
13	5	Jan. 14	14	23	Defective lamp	
13	3	Jan. 14	11	43	.....do	
14	6	Jan. 14	2	38	.....do	
14	5	Jan. 15	10	22	.....do	
14	6	Jan. 15	9	12	.....do	
14	3	Jan. 15	8	47	.....do	
22	3	Jan. 23	14	16	Short circuit in lamp	
25	3	Jan. 26	17	15	Carbon and globe broken	Sleet, snow, and rain.
25	2	Jan. 26	14	45	Carbon broken.....	
Feb. 4	3	Feb. 5	14	12	.....do	
5	5	Feb. 6	13	35	Platinum wire fused.....	
7	3	Feb. 8	9	35	Globe and carbon broken	Feb. 7, heavy north-east gale.
7	1	Feb. 8	7	53	Globe washed off.....	
7	5	Feb. 8	7	38	Carbon and platinum broken	
7	2	Feb. 8	7	03	.....do	
9	3	Feb. 13	48	19	No circuit	Cable chafed off at foot of buoy.
21	3	Feb. 23	24	21	Carbon broken	
25	3	Feb. 26	7	39	.....do	
26	1	Feb. 28	20	24	.....do	Feb. 26, northeast rain and hail storm.
28	5	Mar. 1	10	47	.....do	
Mar. 3	1	Mar. 6	51	52	Cable broken	Mar. 3, northeast gale and snow storm.
3	6	Mar. 6	37	50	Globe broken	
4	2	Mar. 6	19	56	.....do	
7	2	Mar. 7	0	09	Carbon broken.....	
9	2	Mar. 11	29	33	Fault in spar cable	Mar. 9, easterly gale.
9	5	Mar. 10	6	54	Carbon broken.....	
10	3	Mar. 11	7	52	.....do	
12	6	Mar. 13	7	14	.....do	
13	3	Mar. 15	27	52	Lamp wire short circuited	
13	1	Mar. 15	27	32	Carbon broken.....	
15	3	Mar. 16	12	04	Lamp wire short circuited	
20	2	Mar. 21	12	25	.....do	
21	1	Mar. 24	34	51	.....do	Mar. 21, northeast gale.
23	2	Mar. 24	11	40	Carbon broken.....	
27	5	Mar. 29	22	15	.....do	Mar. 27, northeast gale.
27	2	Mar. 29	19	35	Short circuit in lamp.....	
Apr. 11	4	Apr. 11	2	36	.....do	
11	6	Apr. 13	18	51	Platinum fused	
16	6	Apr. 17	14	10	.....do	
18	6	Apr. 19	10	32	Carbon and platinum connection broken..	

TABLE I.—Showing injuries to lamps of the electric buoys in Gedney Channel, New York Bay, N. Y., etc.—Continued.

Date of failure.	No. of buoy.	Date re-newed.	No. of hours extinguished.	Cause.	Remarks.
1891.			<i>H. M.</i>		
Apr. 24	8	Apr. 25	10 18	Lantern glass and globe broken.....	Run down by passing steamer. Lamp ran 484 hrs., 8 min.
May 6	1	May 7	6 05	Run down by passing vessel.....	
11	3	May 13	19 18	Buoy cable chafed off.....	
24	4	May 26	2 35do	Ran 428 hours, 52 minutes.
25	1	May 27	19 39	Defective lamp	
June 4	6	June 4	1 29	Carbon broken.....	
4	1	June 5	9 02do	Ran 798 hours, 30 minutes.
17	2	June 19	15 47	Platinum fused	
18	6	June 19	8 54	Carbon broken.....	
19	6	June 20	8 50	Globe cracked	
20	6	June 21	8 48	Carbon broken.....	

TABLE II.—Showing the number of vessels using the Gedney Cut Channel, between sunset and sunrise, 1888, 1889, 1890, and 1891.

[Officially reported by the New York Maritime Exchange Operator, Sandy Hook, N. J.]

Year and month.	Bound in.	Bound out.	Total.	Remarks.
1888.				
December 4-31	24	18	42	
1889.				
January	30	9	39	
February 4-10	7	2	26	The weather during May and June was very foggy.
February 10-28	17			
March	26	13	39	
April	31	4	35	
May	20	6	26	
June	16	1	17	
Total *	171	53	224	
1889.				
July	15	3	18	Weather very foggy.
August	17	3	20	
September	14	....	14	
October	40	14	54	
November	41	29	70	
December	45	43	88	
1890.				
January	38	23	61	
February	25	12	37	
March	32	12	44	
April	34	17	51	
May	39	16	55	
June	37	20	57	
Total fiscal year July 1, 1889, to June 30, 1890 †	377	192	569	

* Average per month coming in, 24. Average per month going out, 8.
† Average per month coming in, 31.4. Average per month going out, 16.0. Total, 47.4.

TABLE II.—Showing the number of vessels using the Gedney Cut Channel, between sunset and sunrise, etc.—Continued.

Year and month.	Bound in.	Bound out.	Total.	Remarks.
1890.				
July.....	85	27	62	
August.....	29	27	56	
September.....	26	24	50	
October.....	42	33	75	
November.....	67	34	101	
December.....	52	35	87	
1891.				
January.....	39	30	69	White Star steamship <i>Celtic</i> passed in January 17, at 1 a. m. in sleet and hail storm.
February.....	32	23	55	
March.....	38	12	50	
April.....	41	20	61	Steamship <i>Fürst Bismarck</i> passed in May 16, at 12:15 a. m., in fog and rain.
May.....	36	19	55	
June.....	33	13	46	
Total fiscal year July 1, 1890, to June 30, 1891*.....	470	297	767	

* Average per month coming in, 39.1. Average per month going out, 24.7 Total, 64.

Increase per month 1889-'90 over 1888:

	Per cent.
Coming in.....	80.83
Going out.....	100.00
Increase per month, 1890-'91 over 1889-'90:	
Coming in.....	24.52
Going out.....	54.32

TABLE III.—Showing the draught of large-sized steamers passing the bar at Sandy Hook.

Date.	Name.	Draught out.		Draught in.		Nation.	Time at night passing Gedney Bar coming in.
1891.		Ft.	In.	Ft.	In.		
July 11	Etruria.....	27	10	..	..	British.....	
June 13	.....do.....	27	9	..	..	.....do.....	
June 6	.....do.....	..	..	25	8	.....do.....	
July 8	Spain.....	27	10	..	..	.....do.....	
June 27	Umbria.....	27	6	..	..	.....do.....	
May 23	.....do.....	..	..	25	5	.....do.....	
May 15	Fürst Bismarck.....	..	..	24	0	German.....	12.15 a. m., fog and rain.
June 18	.....do.....	26	0	..	..	.....do.....	
June 20	City of Rome.....	..	..	24	7	British.....	
May 23	.....do.....	26	9	..	..	.....do.....	
May 6	City of New York.....	..	..	24	0	.....do.....	9 p. m., cloudy.
June 10	.....do.....	26	2	..	..	.....do.....	
June 3	.....do.....	..	..	23	3	.....do.....	9.45 p. m., hazy.
May 20	City of Paris.....	..	..	24	0	.....do.....	
May 27	.....do.....	26	0	..	..	.....do.....	
June 7	La Champagne.....	..	..	24	6	French.....	2.35 a. m., cloudy.
June 13	.....do.....	26	0	..	..	.....do.....	
June 14	La Bourgogne.....	..	..	24	0	.....do.....	
June 20	.....do.....	26	5	..	..	.....do.....	

TABLE III.—*Showing the draught of large-sized steamers passing the bar at Sandy Hook—*
Continued.

Date.	Name.	Draught out.		Draught in.		Nation.	Time of night passing Gedney Bar coming in.
		Ft.	In.	Ft.	In.		
1891.							
June 27	La Touraine .....	..	..	23	6	French	
July 4	.....do	25	0	..	..	.....do	
May 13	Majestic .....	..	..	23	6	British	
June 17	.....do	25	10	..	..	.....do	
May 6	Teutonic	25	0	..	..	.....do	
May 27	.....do .....	..	..	23	6	.....do	
May 21	Germanic .....	..	..	23	0	.....do	
May 27	.....do	25	1	..	..	.....do	
June 1	Ems .....	..	..	22	6	German	8.20 p. m., hazy.
June 6	.....do	25	0	..	..	.....do	
June 3	Havel .....	..	..	23	10	.....do	
June 9	.....do	27	3	..	..	.....do	
May 14	Trave .....	..	..	23	0	.....do	
May 19	.....do	25	0	..	..	.....do	
May 23	Augusta Victoria .....	..	..	21	7	.....do	
May 28	.....do	26	2	..	..	.....do	
June 20	Egyptian Monarch .....	.....	.....	22	3	British	1.25 a. m., hazy.
May 2	Circassia	23	8	.....	.....	.....do	
June 6	Furnessia	27	1	.....	.....	.....do	
July 11	.....do	27	6	.....	.....	.....do	
May 15	St. Rouans .....	.....	.....	25	0	.....do	7.25 p. m., raining.
May 24	.....do	24	10	.....	.....	.....do	
May 6	Westerland .....	.....	.....	23	0	Belgian	
June 17	.....do	26	9	.....	.....	.....do	
June 24	Noordland	27	0	.....	.....	.....do	
June 27	Pennland	25	0	.....	.....	.....do	
May 3	Amsterdam .....	.....	.....	20	3	Dutch	
May 9	.....do	24	0	.....	.....	.....do	
May 25	Veendam .....	.....	.....	21	0	.....do	
May 6	Buffalo .....	.....	.....	23	0	British	
June 24	Saratoga .....	.....	.....	17	0	United States	
May 25	City of Paris .....	.....	.....	21	3	.....do	
May 2	City of Washington	21	6	.....	.....	.....do	
May 2	Alexandria	22	0	.....	.....	.....do	
May 3	Newport .....	.....	.....	17	0	.....do	

NOTE.—The heaviest draught vessel ever known to be brought into New York was the Anchor Line steamship *Anchoria*, drawing 29 feet, after collision at sea with the steamship *The Queen*. The *Anchoria*'s forward collision compartment was filled with water. This occurred some years ago, before the deepening of the channels by harbor improvements.

The heaviest draught vessel ever taken out was the Spanish ironclad *Numancia*, drawing 28 feet 8 inches, about January, 1874, before harbor improvements.

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REPORT OF THE LIGHT-HOUSE BOARD, 1891.

APPENDIX No. 3.

**REPORT UPON THE INTENSITY OF LIGHTS TO BE USED BY THE
MERCHANT MARINE AS ANCHOR AND RUNNING LIGHTS,**

BY

A COMMITTEE COMPOSED OF

**MR. WALTER S. FRANKLIN, a member of the Light-House Board and Chairman of
the Committee.**

**HENRY F. PICKING, Captain, U. S. Navy and Inspector of the Third Light-
House District.**

**DAVID PORTER HEAP, Major of Engineers, U. S. Army, and Engineer of the Third
Light-House District.**

**PURNELL F. HARRINGTON, Commander, U. S. Navy, and Inspector of the Fourth
Light-House District.**

**JOHN C. MALLERY, Captain of Engineers, U. S. Army, and Engineer of the Fifth
Light-House District.**

INTENSITY OF LIGHTS TO BE USED BY THE MERCHANT MARINE AS ANCHOR AND RUNNING LIGHTS.

BALTIMORE, MD., *September 5, 1891.*

The LIGHT-HOUSE BOARD:

SIRS: In compliance with the Board's instructions of March 6, 1891, the committee appointed to report to the Board the power and intensity of the lights recommended by the International Marine Conference for use by the Merchant Marine as anchor and running lights held its second meeting at the Staten Island depot at 3 p. m. on August 12.

Present—Mr. Walter S. Franklin, a member of the Light-House Board, the chairman of the committee;

Henry F. Picking, captain, U. S. Navy, and inspector of the third light-house district;

David Porter Heap, major of engineers, U. S. Army, and engineer of the third light-house district;

Purnell F. Harrington, commander, U. S. Navy, and inspector of the fourth light-house district.

John C. Mallery, captain of engineers, U. S. Army, and engineer of the fifth light-house district.

The committee went on board the tender *Mistletoe* and proceeded to Gardiners Bay, Long Island, for the purpose of making the required experiments.

At 10:30 a. m. on August 13, the committee met.

Present—Mr. Walter S. Franklin, a member of the Light-House Board, the chairman of the committee;

Henry F. Picking, captain, U. S. Navy, and inspector of the third light-house district;

David Porter Heap, major of engineers, U. S. Army, and engineer of the third light-house district;

Purnell F. Harrington, commander, U. S. Navy, and inspector of the fourth light-house district;

John C. Mallery, captain of engineers, U. S. Army, and engineer of the fifth light-house district.

Maj. D. P. Heap, light-house engineer, third district, proposed a method of conducting the experiments which was adopted by the committee. This method consisted in placing three lanterns on shore for red, white, and green lights respectively, and observing the lights from distances of 1, 2, 3, 4, and 5 miles from the shore station.

The lanterns were provided with stops having slits in them which permitted the candle-power of the lights to be varied from 1 to 43 candle-power. Major Heap also proposed a code of signals for communicating between the observing party and the shore party.

The following is the code referred to, and it was adopted by the committee:

SIGNAL CODE USED IN MAKING CANDLE-POWER TESTS OF RUNNING LIGHTS.

1. A red, white, or green rocket from the steamer will indicate that the candle-power corresponding to the color of the signal is to be increased.
2. A white lens lantern exhibited by the shore party in reply will indicate that the signal from the steamer has been seen.
3. A white lens lantern shown from the upper deck will indicate that the candle-power is to be decreased, and a rocket from the steamer will be fired to indicate the color of the light to be reduced.
4. Should, from any cause, any of the shore lights be extinguished, a white lens lantern will be shown and a rocket fired corresponding to the light extinguished. The disappearance of the white light will indicate that the lamp extinguished has been relighted or in proper working order.
5. Should it not be possible to relight the lamp the lens lantern will be shown three times in quick succession and then extinguished.

Long Beach Bar light-station was selected as the shore station, and on August 13 buoys were placed at distances of 1, 2, 3, 4, and 5 miles from it. White and red lanterns alternated on these buoys, commencing with red on buoy No. 1, one mile distant, to aid in finding the buoys at night.

Captain Mallery was placed in charge of the shore party, with Mr. Joseph Funck, foreman of the lamp shop, as assistant, to vary the candle-power of the different lanterns as signaled from the tender by the committee on board. The experiments commenced at 8:45 p. m., and the inclosed table gives the results.

From these experiments it appears that at 1 mile white light of one candle-power is clearly visible, while for red and green lights 3.2 candle-power is fairly visible. At 2 miles distant white light of 3 candle-power is clearly visible, and red and green lights of 29 and 28.5 candle-power, respectively, clearly visible.

At 3, 4, and 5 miles white light of 3, 23, and 33 candle-power is clearly visible.

The times of signaling were noted on the tender and on shore as a check on the results.

The committee met on the 14th and discussed the results of the experiments, which were considered satisfactory except that the light from the light-house interfered somewhat with the results.

The committee decided to repeat and extend the experiments and to use a shore station where there are no other lights, and under different conditions as to the weather and surroundings.

It was also found difficult to distinguish the green Coston signal from the white one, and it was decided to select a signal giving a more positive color.

The committee then adjourned to meet at New London, Conn., on August 26, on arrival of the 10 a. m. train from New York.

The committee met at New London, Conn., on August 26, pursuant to adjournment.

Present, all members except Mr. Walter S. Franklin.

A meeting was held en route. The proceedings of the former meeting and the tabulated results of the experiments of August 14 were read and approved.

Major Heap, light-house engineer, third district, stated to the committee, with reference to the percentage of loss of light due to the red and green colored glass: given in the table prepared by him from the observations made by Mr. Joseph Funck that it was difficult to compare white with colored lights, and that another observer might obtain different results, and that the decrease of the percentage of loss as the intensity of the lights increases is probably due to the fact that with the low candle-power the brightest and whitest part of the flame is used, while with the higher power the upper and lower parts of the flame come into view, and that these parts contain more red and green rays. Major Heap also stated that a shore station

on the beach of Gardiners Island had been selected, and three posts, 25 feet apart, erected for displaying the lights at a height of about 15 feet above the water, and that buoys had been placed at distances of 1, 2, 3, 4, and 5 miles from the shore station, arranged with lanterns as in the previous experiments. The shore station was favorably situated on a low, narrow sand spit, with water for a background. Owing to a fog and rain, experiments on August 26 had to be abandoned. A table giving the results of the experiments made on August 27 is respectfully inclosed.

The problem before the committee, viz, to determine the least candle-power at which lights of various colors could be clearly seen at definite distances is not capable of a rigorous solution.

In the first place the eyesight of different observers varies, and a light of a certain candle-power would be clearly visible to one while it would be indistinct to another, and might be invisible to a third.

Again, on different nights, apparently clear, the nature of the atmosphere dry or humid, dusty or clean, would have a considerable influence on the range of visibility of the lights.

In the case of colored lights, red or green, the amount of absorption would increase with the density of the color of the glass, and this would also cause large variations in the range of visibility with lights of the same candle-power behind it.

All of the above has been taken into consideration by the committee in drawing its conclusions, and although the candle-powers recommended are not the least that can possibly be seen in all cases, yet they are believed to be the lowest that should be used and still give a proper margin of safety.

The following table shows the candle-powers recommended:

	Candle-power.			
	1 mlie.	2 miles.	5 miles.	
White.....	1	2	30	White-colored glass absorbing 97 per cent of the light.
Red.....	4	40		
Green.....	4	40		

It is evident that less than 1 candle-power of white light could be seen 1 mile, still it is hardly worth while to use a power less than 1 candle.

As about only 3 candle-power of the actual candle-power of the red and green lights was visible, owing to the absorption by the colored glass, the actual difference of candle-power of these lights on the nights of August 14 and 27 was only about three-tenths of a candle-power; so these two sets of observations agree very closely.

The night of August 27 was exceptionally clear; so it was considered safer to adopt the curve of visibility of white light obtained from the observations on the night of August 14.

Absorption of red and green lights.

Number of observations.	Red.		Green.		White.
	Candle power	Loss per cent.	Candle power	Loss per cent.	Candle power.
.....	42.6	95.5	42.6	95.5	42.4
.....	34.0	96.3	34.0	96.3	33.0
.....	29.0	96.8	29.0	96.5	28.5
.....	23.6	97.4	23.2	96.8	23.6

These results were obtained by Mr. Joseph Funck, foreman of the lamp shop, on ten observations made with lanterns used by the committee.

The absorption is much greater than that obtained by Mr. Burstyn and Lieut. Millis, Corps of Engineers, U. S. Army, which was as follows:

Absorption.

	Red glass.	Green glass.
	Per cent.	Per cent.
Mr. Burstyn.....	.60 to .80	.90 to .95
Lieut. Millis.....	.83	.89

In the experiments made with colored lights, ruby and emerald glass was used. This accounts partly for the difference of the results given in the above tables of absorption.

The results obtained by the committee's experiments as to range of visibility do not agree with those of Mr. Burstyn and of Lieut. Millis as given in the following table:

Minimum candle-power visible.

	Two miles.		Five miles.
	Red.	Green.	
Mr. Burstyn	3.7 to 4	.7 to .9	72
Lieut. Millis*.....	1.0	.8	20

* The candle powers given (red and green) are those which get through the glass. The corresponding candle powers without colored glass were 7.11 and 5.47 respectively.

The discrepancies are due in part to the different percentages of absorption. Tubular lens lanterns were used by Lieut. Millis and the lens may have affected the results.

Article 2, (a) (b) (c), Article 3, Article 4, (a) (b) (c) (d), Article 7, first (a) (b), second, third, and Article 11 of Chapter 802, of the act of Congress approved August 19, 1890 (regulations for preventing collisions at sea), are respectfully inclosed.

From which it appears that the scope of the committee's investigation was limited to determining the candle-power of white, red, and green lights at 1 and 2 miles and the candle-power of white light visible at 5 miles.

Respectfully submitted.

WALTER S. FRANKLIN,
Chairman of the Committee.
J. C. MALLERY,
Captain of Engineers, U. S. A., Recorder.

Table of results of experiments relative to candle-power of red, green, and white lights, August 14, 1891.

"C" lantern, red light.			"B" lantern, green light.			"A" lantern, white light.		
Distance.	Candle power.	Visibility.	Distance.	Candle power.	Visibility.	Distance.	Candle power.	Visibility.
Miles.			Miles.			Miles.		
1	1.15	Not visible	1	1.04	Not visible	1	1.00	Clearly visible.
1	1.45	.....do	1	1.36	.....do	1	1.38	Do.
1	2.20	Barely visible.....	1	2.10	Very faint.....	1	2.00	Do.
1	3.20	Fairly visible.....	1	3.20	Brighter but not sufficiently distinct.	1	3.00	Do.
						2	3.00	Do.
2	3.30	Not visible	1	4.00	Fairly distinct.....	3	3.00	Do.
2	4.20	.....do	2	4.00	Not visible	3	4.00	Distinct.
2	5.75	Barely visible	2	5.60	.....do	3	5.00	More distinct.
2	11.00	No perceptible increase.	2	10.50	Visible but not distinct.	3	10.00	Very distinct.
2	17.20	Visible but not distinct in color.	2	17.15	Visible but color not distinct.	4	10.00	Not visible.
2	23.60	Fairly distinguishable.	2	23.20	Visible but color not fully distinct.	4	17.00	Faintly visible.
						4	23.00	Clearly visible.
2	29.00	Distinct	2	23.50	Distinct	4	29.00	Distinct.
2	34.00	.....do	2	33.00	.....do	5	29.00	Faintly visible.
			2	42.40	.....do	5	33.00	Clearly visible.
						5	43.00	Distinct.

NOTE.—After leaving buoy No. 1 red light (3.3 candle power) and green light (4.0 candle power) were visible for one-fourth mile. After leaving buoy No. 2, red light (34 candle power) and green light (42.4 candle power) were visible one-half mile. White light (3 candle power) visible between buoys Nos. 2 and 3, i. e., between 2 and 3 miles. At fourth-mile buoy, red light (34 candle power), green light (42 candle power), and white light (10 candle power) were easily distinguishable through binocular glasses, but were not visible to the naked eye. Weather clear and very favorable for seeing lights. Light southerly breeze; moonlight until 11 p. m.; age of moon eight days. Experiments made between 8:45 and 11:16 p. m.

Table of results of experiments relative to candle-power of red, green, and white lights, August 27, 1891.

"C" lantern, red light.			"B" lantern, green light.			"B" lantern, white light.		
Distance.	Candle power.	Visibility.	Distance.	Candle power.	Visibility.	Distance.	Candle power.	Visibility.
Miles.			Miles.			Miles.		
1	1.15	Not visible*	1	1.04	Not visible*	1	1.04	Light satisfactory.
1	1.45	Visible, color not distinct.	1	1.36	.....do	2	1.04	Visible but faint.
1	2.20	Visible, light satisfactory.	1	2.10	Visible, color faint.	2	1.36	Distinct.
1	3.30	Very clear	1	3.20	Visible, light satisfactory.	3	1.36	Barely visible.
2	4.20	Not visible	1	4.00	Very clear	3	2.10	Visible but indistinct.
2	5.75	Barely discernible	2	5.60	Not visible	3	3.20	Distinct.
2	11.00	Faintly visible ...	2	10.50	Visible but not distinct.	4	3.20	Faintly visible.
2	17.20	Not clear enough.	2	17.15	Faintly visible	4	4.00	Visible, not clear enough.
2	23.60	Distinct	2	23.20	Visible but color not distinct.	4	5.60	Distinct.
			2	23.50	Visible but not bright enough.	5	5.60	Barely visible.
			2	33.00	Visible, not clear enough.	5	10.50	Visible but not distinct.
			2	42.40	Clear, least power for a clear color.	5	17.15	Distinct, clear enough.

*Visible through glasses.
NOTE.—Weather cloudy, with a few patches only of clear sky. Wind SSW. Moderate breeze. No moonlight. At a mile and a third red light (3.30 candle power) and green light (4 candle power) became very faint and at 1½ miles the two lights were invisible.

CHAP. 802.—AN ACT to adopt regulations for preventing collisions at sea.

ART. 2. A steam vessel when under way shall carry (a) on or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the breadth of the vessel exceeds twenty feet, then at a height above the hull not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than forty feet, a bright white light, so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(b) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

ART. 3. A steam vessel when towing another vessel shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than six feet apart, and when towing more than one vessel shall carry an additional bright white light six feet above or below such light, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article two (a), excepting the additional light, which may be carried at a height of not less than fourteen feet above the hull.

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

ART. 4. (a) A vessel which from any accident is not under command shall carry at the same height as a white light mentioned in article two (a), where they can best be seen, and if a steam vessel in lieu of that light, two red lights, in a vertical line one over the other, not less than six feet apart, and of such a character as to be visible all around the horizon at a distance of at least two miles; and shall by day carry in a vertical line one over the other, not less than six feet apart, where they can best be seen, two black balls or shapes, each two feet in diameter.

(b) A vessel employed in laying or in picking up a telegraph cable shall carry in the same position as the white light mentioned in article two (a), and if a steam vessel in lieu of that light, three lights in a vertical line one over the other not less than six feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all around the horizon, at a distance of at least two miles. By day she shall carry in a vertical line, one over the other, not less than six feet apart, where they can best be seen, three shapes not less than two feet in diameter, of which the highest and lowest shall be globular in shape and red in color, and the middle one diamond in shape and white.

(c) The vessels referred to in this article, when not making way through the water, shall not carry the side lights, but when making way shall carry them.

(d) The lights and shapes required to be shown by this article are to be taken by other vessels as signals that the vessel showing them is not under command and can not therefore get out of the way.

These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in article thirty-one.

ART. 7. Steam vessels of less than forty, and vessels under oars or sails of less than

twenty tons, gross tonnage, respectively, when under way, shall not be obliged to carry the lights mentioned in article two (a) (b) and (c), but if they do not carry them they shall be provided with the following lights:

First. Steam vessels of less than forty tons shall carry—

(a) In the forepart of the vessel, or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than nine feet, a bright white light constructed and fixed as prescribed in article two (a), and of such a character as to be visible at a distance of at least two miles.

(b) Green and red side lights constructed and fixed as prescribed in article two (b) and (c), and of such a character as to be visible at a distance of at least one mile, or a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides. Such lantern shall be carried not less than three feet below the white light.

Second. Small steamboats, such as are carried by sea-going vessels, may carry the white light at a less height than nine feet above the gunwale, but it shall be carried above the combined lantern mentioned in subdivision one (b).

Third. Vessels under oars or sails, of less than twenty tons, shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

The vessels referred to in this article shall not be obliged to carry the lights prescribed by article four (a) and article eleven, last paragraph.

ART. 11. A vessel under one hundred and fifty feet in length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of least one mile.

A vessel of one hundred and fifty feet or upwards in length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than fifteen feet lower than the forward light, another such light.

The length of the vessel shall be deemed to be the length appearing in her certificate of registry.

A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by article four (a).

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ANNUAL REPORT
OF THE
LIGHT-HOUSE BOARD

TO THE
SECRETARY OF THE TREASURY

FOR THE
FISCAL YEAR ENDED JUNE 30, 1892.

**HARVARD UNIVERSITY,
LAWRENCE SCIENTIFIC SCHOOL,
ENGINEERING DEPT.**

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1892.

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LIGHT-HOUSE BOARD.

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WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1892.

TREASURY DEPARTMENT.
Document No. 1562.
Office of Light-House Board.

LIGHT-HOUSE BOARD OF THE UNITED STATES.

Organized in conformity to the act of Congress approved August 31, 1852.

LIST OF MEMBERS ON JULY 1, 1892.

Hon. CHARLES FOSTER, Secretary of the Treasury, *ex officio* president.
Mr. WALTER S. FRANKLIN.
Commander GEORGE W. COFFIN, U. S. Navy.
Prof. THOMAS C. MENDENHALL, Superintendent of the U. S. Coast and Geodetic Survey.
Capt. HENRY L. HOWISON, U. S. Navy.
Rear-Admiral JAMES A. GREER, U. S. Navy.
Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army.
Lieut. Col. GEORGE H. ELLIOT, Corps of Engineers, U. S. Army.
Col. OSWALD H. ERNST, Corps of Engineers, U. S. Army.

EXECUTIVE MEMBERS OF THE BOARD.

Chairman.—Rear-Admiral JAMES A. GREER, U. S. Navy.
Naval Secretary.—Commander GEORGE W. COFFIN, U. S. Navy.
Engineer Secretary.—Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army.

OFFICERS IN CHARGE OF LIGHT-HOUSE DISTRICTS.

FIRST DISTRICT.

Inspector.—Commander FRANK WILDES, U. S. Navy, Portland, Me.
Engineer.—Maj. WILLIAM S. STANTON, Corps of Engineers, U. S. Army, to December 14, 1891; Maj. WILLIAM R. LIVERMORE, Corps of Engineers, U. S. Army, Boston, Mass., from December 14, 1891.

SECOND DISTRICT.

Inspector.—Commander GEORGE F. F. WILDE, U. S. Navy, Boston, Mass.
Engineer.—Maj. WILLIAM S. STANTON, Corps of Engineers, U. S. Army, to December 14, 1891; Maj. WILLIAM R. LIVERMORE, Corps of Engineers, U. S. Army, Boston, Mass., from December 14, 1891.

THIRD DISTRICT.

Inspector.—Capt. HENRY F. PICKING, U. S. Navy, to March 3, 1892; Capt. WINFIELD S. SCHLEY, U. S. Navy, Tompkinsville, N. Y., from March 3, 1892.
Engineer.—Maj. DAVID PORTER HEAP, Corps of Engineers, U. S. Army, Tompkinsville, N. Y.

FOURTH DISTRICT.

Inspector.—Commander PURNELL F. HARRINGTON, U. S. Navy, Philadelphia, Pa.
Engineer.—Capt. FREDERICK A. MAHAN, Corps of Engineers, U. S. Army, to December 31, 1891; Capt. EDWARD MAGUIRE, Corps of Engineers, U. S. Army, Philadelphia, Pa., from December 31, 1891.

FIFTH DISTRICT.

Inspector.—Commander CHARLES J. TRAIN, U. S. Navy, Baltimore, Md.

Engineer.—Capt. JOHN C. MALLERY, Corps of Engineers, U. S. Army, to November 14, 1891; Capt. ERIC BERGLAND, Corps of Engineers, U. S. Army, Baltimore, Md., from November 14, 1891.

SIXTH DISTRICT.

Inspector.—Commander JAMES G. GREEN, U. S. Navy, Charleston, S. C.

Engineer.—Capt. JOHN C. MALLERY, Corps of Engineers, U. S. Army, to November 14, 1891; Capt. ERIC BERGLAND, Corps of Engineers, U. S. Army, Baltimore, Md., from November 14, 1891.

SEVENTH DISTRICT.

Inspector.—Commander GEORGE R. DURAND, U. S. Navy, to May 31, 1892; Commander WILLIAM B. NEWMAN, U. S. Navy, Pensacola Navy Yard, from May 31, 1892.

Engineer.—Maj. JAMES B. QUINN, Corps of Engineers, U. S. Army, New Orleans La.

EIGHTH DISTRICT.

Inspector.—Commander DENNIS W. MULLAN, U. S. Navy, New Orleans, La.

Engineer.—Maj. JAMES B. QUINN, Corps of Engineers, U. S. Army, New Orleans, La.

NINTH DISTRICT.

Inspector.—Commander NICOLL LUDLOW, U. S. Navy, Chicago, Ill.

Engineer.—Maj. WILLIAM LUDLOW, Corps of Engineers, brevet lieutenant-colonel, U. S. Army, to June 22, 1892; Col. ORLANDO M. POE, Corps of Engineers, brevet brigadier-general, U. S. Army, Detroit, Mich., from June 22, 1892.

TENTH DISTRICT.

Inspector.—Commander EDWIN T. WOODWARD, U. S. Navy, Buffalo, N. Y.

Engineer.—Maj. LEWIS C. OVERMAN, Corps of Engineers, U. S. Army, to December 30, 1891; Lieut. Col. JARED A. SMITH, Corps of Engineers, U. S. Army, Cleveland, Ohio, from December 30, 1891.

ELEVENTH DISTRICT.

Inspector.—Commander OSCAR F. HEYERMAN, U. S. Navy, to June 22, 1892; Commander EDWIN T. WOODWARD, U. S. Navy, Detroit, Mich., from June 22, 1892.

Engineer.—Maj. WILLIAM LUDLOW, Corps of Engineers, brevet lieutenant-colonel, U. S. Army, to June 22, 1892; Col. ORLANDO M. POE, Corps of Engineers, brevet brigadier-general, U. S. Army, Detroit, Mich., from June 22, 1892.

TWELFTH DISTRICT.

Inspector.—Commander THOMAS PERRY, U. S. Navy, San Francisco, Cal.

Engineer.—Maj. WILLIAM H. HEUER, Corps of Engineers, U. S. Army, San Francisco, Cal.

THIRTEENTH DISTRICT.

Inspector.—Lieut. Commander WILLIAM W. RHODES, U. S. Navy, Portland, Oregon.

Engineer.—Maj. THOMAS H. HANDBURY, Corps of Engineers, U. S. Army, Portland, Oregon.

FOURTEENTH DISTRICT.

Inspector.—Commander CHARLES MCGREGOR, U. S. Navy, to August 1, 1891; Lieut. Col. WILLIAM E. MERRILL, Corps of Engineers, brevet colonel, U. S. Army, to August 13, 1891; Commander EDWIN M. SHEPARD, U. S. Navy, Cincinnati, Ohio, from August 13, 1891.

Engineer.—Lieut. Col. WILLIAM E. MERRILL, Corps of Engineers, brevet colonel, U. S. Army, to December 14, 1891; Maj. AMOS STICKNEY, Corps of Engineers, U. S. Army, Cincinnati, Ohio, from January 30, 1892.

FIFTEENTH DISTRICT.

Inspector.—Commander WILLIAM C. WISE, U. S. Navy, St. Louis, Mo.

Engineer.—Lieut. Col. CHARLES R. SUTER, Corps of Engineers, U. S. Army, St. Louis, Mo.

SIXTEENTH DISTRICT.

Inspector.—Lieut. Commander ROBERT M. BERRY, U. S. Navy, Memphis, Tenn.

Engineer.—Lieut. Col. CHARLES R. SUTER, Corps of Engineers, U. S. Army, St. Louis, Mo.

REPORT

OF

THE UNITED STATES LIGHT-HOUSE BOARD.

TREASURY DEPARTMENT,
OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, D. C., November 10, 1892.

SIR: The Light-House Board has the honor to submit, for your information and that of Congress, the following report of the work done under its direction during the fiscal year which ended on June 30, 1892:

At the close of the year there were under the control of the Light-House Establishment the following-named aids to navigation:

Light-houses and beacon lights, including the 323 post lights in the third, fourth, fifth, sixth, eighth, twelfth, and thirteenth light-house districts....	1, 255
Light-ships in position.....	32
Light-ships for relief.....	4
Electric buoys in position.....	7
Gas buoys in position.....	2
Fog signals operated by steam or hot air.....	107
Fog signals operated by clockwork.....	187
Post lights on the Western rivers.....	1, 369
Day or unlighted beacons.....	420
Whistling buoys in position.....	62
Bell buoys in position.....	89
Other buoys in position, including pile buoys and stakes in fifth district and thirty buoys in Alaskan waters.....	4, 286

In the construction, care, and maintenance of these aids to navigation there were employed:

Steam tenders.....	30
Steam launches.....	6
Sailing tenders.....	2
Light-keepers.....	1, 136
Other employes, including crews of light-ships and tenders.....	870
Laborers in charge of Western river lights.....	1, 248

NEW LIGHTS.

The following-named new lights were established during the fiscal year:

South Brother Island Ledge Post Light, East River, New York.—A tubular-lantern light, July 1, 1891.

Lawrence Point Ledge Post Light, East River, New York.—A tubular-lantern light, July 1, 1891.

- Bush Bluff Light-Vessel, No. 46, Elizabeth River, Virginia.*—Two reflector lights, July 15, 1891.
- Colt Pier Post Light, Connecticut River, Connecticut.*—A tubular-lantern light, July 16, 1891.
- Moosabec Reach Beacon Light, entrance to Jonesport, Maine.*—A lens-lantern light, July 20, 1891.
- Saugerties Creek South Dike Post Light, Hudson River, New York.*—A tubular-lantern light, July 22, 1891.
- Great Round Shoal Light-Vessel, No. 47, eastern entrance to Nantucket Sound, Massachusetts.*—Two reflector lights, July 28, 1891.
- Pistol Point Post Light, Connecticut River, Connecticut.*—A tubular-lantern light, July 30, 1891.
- Sandy Hook Light-Vessel, No. 48, entrance to New York Bay, New York.*—Two reflector lights, August 1, 1891.
- Esopus Island Post Light, Hudson River, New York.*—Two tubular-lantern lights, August 21, 1891.
- Watch Point, Lake Champlain, Vermont.*—A tubular-lantern light, September 5, 1891.
- Batton Island Post Light, No. 2, St. Johns River, Florida.*—A tubular-lantern light, September 25, 1891.
- Devils Island, Lake Superior, Wisconsin.*—A fourth-order light, September 30, 1891.
- Simmons Reef Light-Vessel, No. 55, Lake Michigan, Michigan.*—Two groups of lens-lantern lights, October 22, 1891.
- White Shoal Light-Vessel, No. 56, Lake Michigan, Michigan.*—Two groups of lens-lantern lights, October 22, 1891.
- Grays Reef Light-Vessel, No. 57, Lake Michigan, Michigan.*—Two groups of lens-lantern lights, October 22, 1891.
- Pleasure Island Post Light, Hudson River, New York.*—A tubular-lantern light, October 31, 1891.
- Covells Folly Post Light, Hudson River, New York.*—A tubular-lantern light, October 31, 1891.
- Cape Charles City Range Lights, Chesapeake Bay, Virginia.*—Two lens-lantern lights, October 31, 1891.
- Cape Charles City Harbor, Chesapeake Bay, Virginia.*—Two tubular-lantern lights, October 31, 1891.
- Rouse Point Pierhead, Lake Champlain, New York.*—A tubular-lantern light, November 10, 1891.
- Otter Creek, Lake Champlain, Vermont.*—A tubular-lantern light, November 10, 1891.
- Greenbury Point Shoal, entrance to Annapolis Harbor, Maryland.*—A fourth-order light, November 15, 1891.
- Kewaunee Pierhead Range (front), Lake Michigan, Wisconsin.*—A tubular-lantern light, November 15, 1891.
- Wamsutta Mill, New Bedford Harbor, Massachusetts.*—An electric light, December 31, 1891.

- Grant Farm (upper) Post Light, No. 9½, Indian River, Florida.*—A tubular-lantern light, December 31, 1891.
- Crawford Point Post Light, No. 15½, Indian River, Florida.*—A tubular-lantern light, December 31, 1891.
- Taylor Creek Post Light, No. 22½, Indian River, Florida.*—A tubular-lantern light, December 31, 1891.
- Destruction Island, seacoast of Washington.*—A first-order light, January 1, 1892.
- Bailey Point Post Light, No. 2, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Scotch Cap Post Light, No. 1, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Cow Point Post Light, No. 4, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Ice House Post Light, No. 3, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Bartlett Point Post Light, No. 5, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Comstock Wharf Post Light, No. 7, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Allyn Point Post Light, No. 6, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Long Reach (lower) Post Light, No. 8, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Long Reach (upper) Post Light, No. 9, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Stoddards Old Dock Post Light, No. 10, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Waldens Island Post Light, No. 12, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Mohegan Dike Post Light, No. 14, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Indian Hill Post Light, No. 11, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Pride Pier Post Light, No. 16, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Burnt House Pier Post Light, No. 18, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Perche Rock Post Light, No. 13, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Sand Pier Post Light, No. 15, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- Lower Coal Dock Post Light, No. 20, Thames River, Connecticut.*—A tubular-lantern light, March 29, 1892.
- St. Joseph Pierhead Range (front), Lake Michigan, Michigan.*—A tubular-lantern light (reestablished) March 31, 1892.

Grassy Point Middle Ground Post Light, No. 34, St. Johns River, Florida.—A tubular-lantern light, about April 12, 1892.

Columbia River Light-Vessel, No. 50, entrance to Columbia River, Washington.—Two reflector lights, April 15, 1892.

Seul Choix Pointe, Lake Michigan, Michigan.—A fourth-order light, April 15, 1892.

Two Harbors, Lake Superior, Minnesota.—A fourth-order light, April 15, 1892.

Sheboygan Pierhead Range (front), Lake Michigan, Wisconsin.—A lens-lantern light, April 25, 1892.

McWilliams Point Shoal, Pamlico River, North Carolina.—A tubular-lantern light, May 15, 1892.

NEW FOG SIGNALS.

During the fiscal year fog signals were established at the following-named existing light-stations:

Hendricks Head, entrance to Sheepscot River, Maine.—A bell struck by machinery, July 15, 1891.

Sandy Hook Light-Vessel, No. 48, entrance to New York Bay, New York.—A 12-inch steam chime-whistle, August 1, 1891.

Point Betsey, east shore of Lake Michigan, Michigan.—A 10-inch steam whistle, December 31, 1891.

Sandy Hook, entrance to New York Bay, New Jersey.—A bell struck by machinery, March 31, 1892.

The following-named new fog signals were established during the fiscal year:

Bush Bluff Light-Vessel, No. 46, Elizabeth River, Virginia.—A 12-inch steam whistle, July 15, 1891.

Great Round Shoal Light-Vessel, No. 47, eastern entrance to Nantucket Sound, Massachusetts.—A 12-inch steam chime-whistle, July 28, 1891.

Devils Island, Apostle Group, Lake Superior, Wisconsin.—A 10-inch steam whistle, September 30, 1891.

Simmons Reef Light-Vessel, No. 55, north end of Lake Michigan, Michigan.—A 6-inch steam whistle, October 22, 1891.

White Shoal Light-Vessel, No. 56, north end of Lake Michigan, Michigan.—A 6-inch steam whistle, October 22, 1891.

Grays Reef Light-Vessel, No. 57, north end of Lake Michigan, Michigan.—A 6-inch steam whistle, October 22, 1891.

Greenbury Point Shoal, entrance to Annapolis Harbor, Maryland.—A bell struck by machinery, November 15, 1891.

Destruction Island, seacoast of Washington.—A first-class steam siren, November 15, 1891.

St. George Reef, seacoast of California.—A 12-inch steam whistle, December 1, 1891.

Columbia River Light-Vessel, No. 50, entrance to Columbia River, Washington.—A 12-inch steam whistle, April 15, 1892.

Two Harbors, north shore of Lake Superior, Minnesota.—A 10-inch steam whistle, April 15, 1892.

LIGHTS DISCONTINUED.

The following-named lights were, in the course of the fiscal year, discontinued:

Wreck of the Palestine Light-Vessel, entrance to San Francisco Bay, California.—Two tubular-lantern lights, July 23, 1891.

Relief Light-Vessel, No. 9, Great Round Shoal, eastern entrance to Nantucket Sound, Massachusetts.—A reflector light, July 28, 1891.

Sandy Hook Light-Vessel, No. 16, entrance to New York Bay, New York.—A reflector light, August 1, 1891.

St. Joseph Pierhead (front), Lake Michigan, Michigan.—A tubular-lantern light, October 31, 1891.

Flood Rock Post Light, East River, New York.—Two tubular-lantern lights, November 10, 1891.

Greenbury Point, entrance to Annapolis Harbor, Maryland.—A sixth-order light, November 15, 1891.

Fairhaven Bridge, New Bedford Harbor, Massachusetts.—A reflector light, March 31, 1892.

Hendricks Point Post Light, No. 30, St. Johns River, Florida.—A tubular-lantern light, about April 12, 1892.

Long Reach (lower) Post Light, No. 8, Thames River, Connecticut.—A tubular-lantern light, about April 27, 1892.

FOG SIGNAL DISCONTINUED.

The following-named fog signal was discontinued during the fiscal year:

Castle Hill, entrance to Narragansett Bay, Rhode Island.—A bell struck by machinery, November 30, 1891.

CHANGES IN LIGHTS.

During the fiscal year the following changes were made in existing lights:

Sampit River, Winyah Bay, South Carolina.—Changed from a fixed white light to a fixed red light, July 20, 1891.

Croatan, Croatan Sound, North Carolina.—Changed from a fixed white light to fixed white with a fixed red sector between the bearings, from seaward, NW. $\frac{3}{4}$ N. and W. $\frac{7}{8}$ N., July 30, 1891.

Roanoke Marshes, Pamlico Sound, North Carolina.—Changed from fixed red to fixed white with a fixed red sector between the bearings, from seaward, S. $\frac{1}{4}$ E. and S. $\frac{7}{8}$ E., July 30, 1891.

Vineyard Sound Light-Vessel, No. 41, western entrance to Vineyard Sound, Massachusetts.—Changed from two fixed white lights to two fixed red lights, August 12, 1891.

Portage River, Lake Superior, Michigan.—Changed from a fixed white light varied by a red flash every two minutes to a fixed white light varied by a red flash every minute, August 15, 1891.

Tawas (Ottawa), Lake Huron, Michigan.—Changed from a flashing light of the fifth order to an occulting light of the fourth order, August 31, 1891.

Menominee Pierhead, Green Bay, Michigan.—Changed from a fixed red light of the fifth order to a fixed red light of the fourth order, September 10, 1891.

Porte des Morts (Pilot Island), entrance to Green Bay, Wisconsin.—Changed from a flashing white light every minute to a fixed red light, September 15, 1891.

Alligator Reef, Florida Reefs, Florida.—Changed to a flashing white and red light, every third flash red, from SW. by W. $\frac{1}{8}$ W. through southward to NE. $\frac{1}{4}$ E., and from NE. by E. $\frac{3}{4}$ E. through northward to SW. $\frac{1}{2}$ S.; flashing red throughout the intervening sectors; interval between flashes five seconds, September 30, 1891.

Sand Key, Florida Reefs, Florida.—Changed to a fixed white light for one minute, varied in the next minute by a white flash of ten seconds' duration, preceded and followed by partial eclipses of twenty-five seconds, from W. $\frac{3}{4}$ S. through southward to ENE. $\frac{1}{4}$ E. and from E. $\frac{1}{2}$ N. through northward to SW. $\frac{1}{4}$ W.; fixed red for one minute, varied in the next minute by a red flash of ten seconds' duration, preceded and followed by partial eclipses of twenty-five seconds throughout the intervening sectors, September 30, 1891.

North Dumpling, Fishers Island Sound, New York.—Changed from a fixed red light to fixed white with a fixed red sector extending from W. $\frac{1}{4}$ S. through southward and eastward to NNE. $\frac{7}{8}$ E., October 15, 1891.

New London Harbor, entrance to Thames River, Connecticut.—Changed from fixed white to fixed white with a fixed red sector extending from N. $\frac{7}{8}$ E. westerly to NE. $\frac{5}{8}$ E., October 15, 1891.

Havre de Grace, entrance to the Susquehanna River, Maryland.—Changed from sixth order to fifth order, October 28, 1891.

Cross Rip Light-Vessel, No. 5, Nantucket Sound, Massachusetts.—Changed from a fixed white to a fixed red light, February 29, 1892.

Mobile Point Beacon, entrance to Mobile Bay, Alabama.—Changed from a fixed red to a fixed white light, February 29, 1892.

Bells Rock, York River, Virginia.—Changed from fixed white to fixed white with a fixed red sector between NNW. $\frac{1}{2}$ W. through eastward and northward to SE. by E. $\frac{3}{4}$ E., March 10, 1892.

Point Hueneme, entrance to Santa Barbara Channel, California.—Changed from fixed red to an occulting white light, with intervals of five seconds between the eclipses, April 15, 1892.

Point Betsey, east shore of Lake Michigan, Michigan.—Changed from fixed white varied by a white flash every ninety seconds, to flashing white every ten seconds, April 23, 1892.

Monomoy Point, eastern entrance to Nantucket Sound, Massachusetts.—Changed from fixed white to fixed white with a fixed red sector between the bearings W. $\frac{1}{4}$ S. and W. $\frac{3}{4}$ N., May 25, 1892.

Cold Spring Harbor, Long Island Sound, New York.—Changed from fixed red to fixed white, with a fixed red sector between SE. $\frac{3}{4}$ E., through westward to NE. $\frac{1}{4}$ E., May 31, 1892.

Execution Rocks, Long Island Sound, New York.—Changed from a fixed to a flashing light at intervals of ten seconds, May 31, 1892.

Sands Point, Long Island Sound, New York.—Changed from a flashing white light every thirty seconds to fixed white, May 31, 1892.

Brandywine Shoal, Delaware Bay, Delaware.—Changed to a fixed light during periods of twenty-seven seconds, separated by eclipses of three seconds' duration, June 20, 1892.

Fourteen-Foot Bank, Delaware Bay, Delaware.—Changed from a flashing light every fifteen seconds to a fixed light during alternate periods of fourteen and forty seconds, separated by eclipses of three seconds' duration, June 20, 1892.

Cross Ledge, Delaware Bay, New Jersey.—Changed to a fixed light during periods of seventeen seconds, separated by eclipses of three seconds' duration, June 20, 1892.

Ship John Shoal, Delaware Bay, New Jersey.—Changed to a fixed light during periods of fifty-seven seconds, separated by eclipses of three seconds' duration, June 20, 1892.

CHANGES IN FOG SIGNALS.

During the fiscal year the following-described changes were made in existing fog signals:

Libby Islands, Machias Bay, Maine.—Changed from a third-class Daboll trumpet to a 10-inch steam whistle, August 15, 1891.

Brenton Reef Light-Vessel, No. 11, entrance to Narragansett Bay, Rhode Island.—The bell was made to ring continuously for about ten seconds, followed by a silent interval of about thirty seconds, November 23, 1891.

Mount Desert, seacoast of Maine.—Changed from a bell struck by machinery to a third-class Daboll trumpet, November 30, 1891.

Execution Rocks, Long Island Sound, New York.—Changed from a first-class Daboll trumpet to an automatic steam siren, December 31, 1891.

Grosse Pointe, west shore of Lake Michigan, Illinois.—Changed from a first-class steam siren to a 10-inch steam whistle, April 9, 1892.
Penfield Reef, Long Island Sound, Connecticut.—Changed from a bell struck by machinery to a Daboll trumpet, May 31, 1892.

CHANGES IN LOCATION.

The location of the following-named lights was changed during the fiscal year:

Prospect Harbor, seacoast of Maine.—Moved to a new tower about 25 feet southerly, July 25, 1891.

Cuttyhunk, Vineyard Sound, Massachusetts.—Moved to a new tower about 45 feet W. $\frac{1}{8}$ S. from former position, August 15, 1891.

West Chop, Vineyard Sound, Massachusetts.—Moved to a temporary tower about 60 feet SE. $\frac{1}{8}$ S. from former position, August 20, 1891.

Presqu'ile Pierhead, Lake Erie, Pennsylvania.—Moved to within 30 feet of the outer end of the north pier, October 10, 1891.

Kewaunee Pierhead, west shore of Lake Michigan, Wisconsin.—Moved about 200 feet nearer the outer end of the north pier, October 16, 1891.

Esopus Island Post Light, Hudson River, New York.—Moved about 300 feet to the southward, November 12, 1891.

Niagara River Range, Niagara River, New York.—The rear light was transferred to a new structure erected on the range line 23 feet nearer the front light, November 27, 1891.

Coxsackie East Flats, Hudson River, New York.—The post light was discontinued and the light established on a beacon erected alongside the former position, November 30, 1891.

Sand Spit, Hudson River, New York.—The post light was discontinued and the light established on a beacon erected alongside the former position, December 15, 1891.

West Chop, Vineyard Sound, Massachusetts.—Transferred to a new tower, 17 feet higher than the old tower, erected on the old site, December 31, 1891.

Gasparilla Island Beacon, entrance to Charlotte Harbor, Florida.—Removed to a secure site about 225 feet nearer the main light, March, 1892.

Nauset Beach, Cape Cod, Massachusetts.—Each of the three lights was moved to a new tower erected about 30 feet to the westward of the corresponding old tower, and the lights raised 4 feet, April 25, 1892.

Pride Pier Post Light, No. 16, Thames River, Connecticut.—Moved about 75 feet to the eastward, about April 27, 1892.

Burnt House Pier Post Light, No. 18, Thames River, Connecticut.—Moved about 50 feet to the eastward, about April 27, 1892.

Sand Pier Post Light, No. 15, Thames River, Connecticut.—Moved about 200 feet to the southward and westward, about April 27, 1892.

Fairport Pierhead, Lake Erie, Ohio.—Moved about 117 feet to the northward and to within 28 feet of the outer end of the east pier, May, 1892.

Morris Island South Range, Charleston Harbor, South Carolina.—The front beacon was moved about 180 feet nearer the Charleston Main Light, June 16, 1891.

Morris Island North Range, Charleston Harbor, South Carolina.—The front beacon was moved about 175 feet nearer the Charleston Main Light, June 16, 1892.

Plattsburg Breakwater, Lake Champlain, New York.—The northeast light was moved to the north end of the breakwater as extended, June 18, 1892.

Huron, Lake Erie, Ohio.—Moved about 120 feet in a northeasterly direction to within 20 feet of the end of the west pier, June, 1892.

TEMPORARY CHANGES IN AIDS TO NAVIGATION.

During the fiscal year the following temporary changes were made in aids to navigation:

Brenton Reef Light-Vessel, No. 11, entrance to Narragansett Bay, Rhode Island.—Replaced on her station after being repaired, July 22, 1891.

Winter-Quarter Shoal Light-Vessel, No. 45, seacoast of Virginia.—Withdrawn from her station for repairs and the schooner *Drift* substituted, August 29, 1891. The schooner *Drift* parted her moorings and went adrift October 12, 1891. The Red Star tug *Argus* placed on the station October 17 and remained until replaced by light-vessel, No. 45, on October 22, 1891.

Man-o'-War Rock Post Light, East River, New York.—The structure was destroyed November 2, and the light was reestablished December 15, 1891.

Nantucket New South Shoal Light-Vessel, No. 1, seacoast of Massachusetts.—Parted her moorings and went adrift on March 15 and was replaced March 26, 1892.

Galveston Light-Vessel, No. 28, entrance to Galveston Bay, Texas.—Removed from her station for repairs March 25, and replaced April 15, 1892.

Trinity Shoal Light-Vessel, No. 43, seacoast of Louisiana.—Removed from her station for repairs May 24, and replaced July 14, 1892.

Nantucket New South Shoal Light-Vessel, No. 1, seacoast of Massachusetts.—Removed from her station for repairs and Relief Light-Vessel, No. 9, substituted June 14, 1892.

NEW BUOYS.

During the fiscal year the following-named special buoys were established:

Cod Ledge, Portsmouth Harbor, New Hampshire.—A bell buoy for trial, July, 1891.

North Channel Entrance, Tampa Bay, Florida.—A whistling buoy, July, 1891.

Wreck of the Palestine, entrance to San Francisco Bay, California.—A bell buoy, July 23, 1891.

Block Island Breakwater, Block Island Sound, Rhode Island.—A bell buoy, August 20, 1891.

Great Pig Rocks, entrance to Swampscott, Massachusetts.—A bell buoy, September 17, 1891.

Western Breakwater, New Haven Harbor, Connecticut.—A bell buoy, October 5, 1891.

Entrance Buoy, Charleston Harbor, South Carolina.—A bell buoy, November 6, 1891.

Wreck, Boston Harbor, Massachusetts.—A gas buoy, December 2, 1891, and discontinued soon after when the wreck disappeared.

Cold Spring Harbor, Long Island Sound, New York.—A bell buoy, December 12, 1891.

Pitch of the Hook, entrance to New York Bay, New York.—A bell buoy, December, 1891.

Point Partridge, Strait of Juan de Fuca, Washington.—A bell buoy, December 24, 1891.

Duwamish Head, Puget Sound, Washington.—A bell buoy, December 24, 1891.

Butler Flat, New Bedford Harbor, Massachusetts.—A gas buoy, December 31, 1891.

Wreck of the Lucy Jones, Nantucket Sound, Massachusetts.—A bell buoy, February 9, 1892.

Ship Island Anchorage, Mississippi Sound, Mississippi.—A bell buoy, February 10, 1892.

Chatham Bar, seacoast of Massachusetts.—A whistling buoy, February 14, 1892.

Quicks Hole, Vineyard Sound, Massachusetts.—A bell buoy, March 28, 1892.

Avery Rock, Rockport Harbor, Massachusetts.—A bell buoy, May 6, 1892.

Wreck of the Florida, seacoast of New Jersey.—A bell buoy, May 6, 1892.

Southwest Spit, New York Bay, New York.—An electric buoy, June 15, 1892.

BUOYS DISCONTINUED.

During the fiscal year the following-named special buoys were discontinued:

Wreck of the Palestine, entrance to San Francisco Bay, California.—

A bell buoy, September 19, 1891.

Cod Ledge, Portsmouth Harbor, New Hampshire.—A bell buoy, February, 1892.

Wreck of the Lucy Jones, Nantucket Sound, Massachusetts.—A bell buoy, March, 1892.

CHANGES IN BUOYS.

The following changes were made in special buoys during the fiscal year:

Northeast Grave, Massachusetts Bay, Massachusetts.—The whistling buoy was moved about three-eighths of a nautical mile N. $\frac{1}{2}$ E., July 29, 1891.

Little River (Cutler) Harbor, seacoast of Maine.—The whistling buoy was moved about one-half mile NW. by W., October 10, 1891.

Gedney Channel, entrance to New York Bay, New York.—The whistling buoy was moved about five-sixteenths of a mile N. by E. $\frac{1}{2}$ E., March 31, 1892.

Entrance to Cumberland Sound and Fernandina, seacoast of Florida.—The bell buoy was moved nearly seven-sixteenths of a mile S. $\frac{1}{4}$ E., May 30, 1892.

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Aids to navigation maintained by the Light-House Establishment on June 30, 1892.

**APPROPRIATIONS MADE AT THE FIRST SESSION OF THE FIFTY-SECOND CONGRESS FOR
LIGHT-HOUSE PURPOSES.**

Bar Point light-ship, Lake Erie, Michigan.....	\$25, 000
Buffalo Breakwater fog signal, Lake Erie, New York	4, 300
Cape Meares light-station, Oregon, \$5,000	Authorized.
Cape Mendocino light-station, California, roadway	500
Depot for thirteenth light-house district, Oregon, \$15,000	Authorized.
Detroit River light-vessels, Michigan.....	8, 600
Eleven-Foot Shoal, Michigan, one or more light-ships, \$60,000	Authorized.
Frankfort Pierhead fog bell, Michigan.....	1, 000
Grassy Island range-lights, Detroit River, Michigan	1, 500
Grosse Isle range-lights, Detroit River, Michigan.....	2, 500
Key West light-station, Florida, increasing height of tower.....	3, 000
Limekiln Crossing light-ships, Detroit River, Michigan	1, 000
Mamajuda range-light, Detroit River, Michigan	1, 500
Nantucket New South Shoal light-ship, Massachusetts.....	70, 000
Oil houses	10, 000
Patrol steamer for St. Marys River, Michigan.....	4, 000
Port Penn range lights, Delaware River, Delaware.....	10, 000
St. Simons range beacon, Georgia	1, 000
St. Marys River upper range lights, Michigan	5, 000
Superior Bay Lights, Wisconsin.....	1, 200
Staten Island Light-House Depot, New York, sea wall.....	25, 000
Tampa Bay, Florida, additional aids to navigation.....	6, 000
Total	181, 100

GENERAL.

Supplies of light-houses	370, 000
Repairs of light-houses	345, 000
Salaries of light-keepers	660, 000
Expenses of light-vessels.....	250, 000
Expenses of buoyage	330, 000
Expenses of fog-signals	70, 000
Expenses of members of board inspecting lights, etc.....	3, 000
Lighting rivers	280, 000
Survey of light-house sites.....	1, 000
Total	2, 309, 000

DEFICIENCIES.

For legal services in examining title to land and water front at Portsmouth, Va	\$244. 25
For legal services in correcting error in title to site for light-house at Grindel Point, Maine.....	79. 30
Payment to George S. Prindle, special assistant United States attorney, for services in examining the patent for the Courtenay automatic whistling buoy	75. 00
For salaries of keepers of light-houses.....	111. 27
For supplies of light-houses, except for services over Pacific railroads	2, 411. 18
For expenses of light-vessels	202. 98
For expenses of buoyage	4, 473. 66
For lighting of rivers	2, 124. 11
For supplies of light-houses.....	530. 28
For expenses of buoyage, except for services over Pacific railroads	1, 977. 69
Total.....	12, 229. 72

A detailed statement of the work done in each of the sixteen light-house districts is made in the body of the report, under specified headings, from which it will be evident that the Board has brought the numerous and varied aids to navigation under its charge up to the proper standard, and that it has done all that was possible, with the funds provided, to meet the requirements of commerce and navigation.

THE PROHIBITION OF PRIVATE LIGHTS.

The following recommendation, which has been made in many previous annual reports, is renewed:

The Board renews its recommendations that proper steps be taken to prohibit the establishment or maintenance of private lights and buoys in the navigable waters of the United States except with the consent of the Board, and it again asks that provisions be made to enable it to establish inexpensive and temporary lights in case of exigency and pending the action of Congress. In this connection the Board begs leave to repeat the recommendation made in its annual report for 1883:

"Some action should be taken relative to the establishment of lights and buoys by steamboat companies and other private parties, simply for their own convenience. The Board can not establish a light without special authority of law in each case. It never exhibits a light without previously issuing a formal notice to mariners, and it never extinguishes one without giving similar notice sufficiently in advance to inform all concerned. Private lights are established and extinguished without such notice, much to the annoyance of mariners, who are confused and misled by irregular beacons. Besides this, the lights, not being properly kept, go out from time to time.

"One of the best of these private lights is that exhibited from Blackwells Island by the municipality of New York City. It has gone out a number of times recently, and so much to the inconvenience, if not danger, of mariners that complaint has been made and the Board has been subjected to unmerited criticism for failing to do what was alleged to be its duty, when in fact it has not the slightest control over that light. Under these circumstances the Board suggests that the exhibition of lights and the placing of buoys by corporations or private parties be prohibited by law. Lest any interest should suffer thereby it is further suggested that the Board, on being satisfied that it is immediately necessary to do so, be authorized to establish inexpensive temporary lights, if necessary, on leased land, and to pay for their erection and maintenance, together with the cost of employing laborers to act as keepers, as is now done on the western rivers, from the general appropriations for the support of the Light-House Establishment, provided that funds can be spared from them for that purpose, and further provided that the Board shall make report of its actions in each case, with the reason therefor, so that Congress may decide as to the continuance of each light."

OIL HOUSES.

The Board again recommends that appropriation be made for the erection of small, inexpensive structures near to, but separate from, light-houses, in which to keep a year's supply of mineral oil, the illuminant now used by the Light-House Establishment. Last year the Board estimated that \$15,000 could be expended with great advantage during the year, among the larger, more isolated, and more important light-stations. An appropriation of \$10,000 was made for that purpose, which will be expended during the current year.

It is estimated that \$15,000 will be needed and can be profitably expended in building oil houses during the coming fiscal year, and the appropriation of that amount is therefore recommended.

The recommendation made in the annual report for each of the last six years was accompanied by the following explanation:

The substitution of mineral oil for lard oil in the light-house service, which has been in progress for several years, is now finished. As the quantity of the oil now used is larger, and as its bulk is greater than was that of the oil formerly used, and as the mineral oil is much more likely to occasion fire, and indeed to take fire, than was the lard oil, the Board has come to the conclusion, in the interest of safety, to advise that the proper steps be taken to have a house erected at each of the larger stations from a plan specially devised after careful study for the purpose.

THE LOWEST BID.

The following recommendation, which was made in the Board's annual report for each year since 1887, is renewed:

The Board calls attention to the hampered condition in which it is left by that provision of law which requires the Board to accept the lowest bid to do work for which it has advertised for proposals, no matter how unfit the bidder or how impossible it may be for him to do good work, provided he can give a good bond. It has repeatedly happened that under this clause the Board has been forced to contract with persons who had no proper plant to do the work; with persons who, to get the work, had bid far below its proper cost, and with persons who had done poor work for the Board under previous contracts, and in each instance the result was, as was to be expected, poor, unsatisfactory, unreliable work, which it was necessary to begin to repair soon after it was finished.

As an instance of this the Board refers to the case of the steamer *Zizania*, which should have been completed more than a year ago. Eight months after she should have been finished the contractors made an assignment, and the Government was forced to finish the vessel itself. It was then found that much of the work done was of so poor a character that it became necessary to do it over. This added largely to the cost of the vessel and increased the time required for building it. The Board needed the tender at the time the appropriation was made for her construction. It would have had her services more than a year ago if the contract had been let to the best rather than the lowest bidder. The recourse against the sureties of contractors for bad work, as a rule, fails to be effective. In rare cases where a penalty has been exacted it has been made the basis of claims against Congress which have been sometimes prosecuted to a successful issue. But, bad as this is, there is nothing to prevent failing or fraudulent contractors from becoming the lowest bidders for fresh work. In fact there is nothing under the present state of the law, and the construction given it, to prevent the failing contractors for the tender *Zizania*, bad and late as their work was, from getting the contract for building the new supply ship, for which appropriation has just been made, if they bid low enough and can again provide satisfactory bondsmen. The Board suggests that it may be protected against such evils by appropriate legislation.

The following is the text of section 4667, Revised Statutes:

"No contract for the erection of any light-house shall be made except after public advertisement for proposals in such form and manner as to secure general notice thereof, and the same shall only be made with the lowest bidder therefor, upon security deemed sufficient in the judgment of the Secretary of the Treasury."

It is proposed that this section be modified by adding the following proviso:

"*Provided*, That when, in the opinion of the Secretary of the Treasury, it shall be detrimental to the interests of the Government to contract with the lowest bidder,

he shall contract with the next lowest bidder not subject to similar objections, but the Secretary of the Treasury shall put on record his reasons therefor in each such case in the letter rejecting such lowest bid or bids."

NEW WORKS AUTHORIZED.

Congress authorized, by different acts, the establishment of two different light-stations at a cost, in the aggregate, of about \$55,000, but no appropriations were made for their construction. The following-named aids to navigation were authorized by these acts:

Rockland Lake light-station with fog signal, Oyster Bed Shoal, Hudson

River, New York, authorized by act of March 2, 1889..... \$35,000

St. Catherine Island light-station, Georgia, authorized by act of March 2, 1889. 20,000

LIGHTING BRIDGES.

The following recommendation, which was made in the Board's annual report for each year since 1887, is renewed:

All persons operating bridges over navigable rivers were required by the act of August 7, 1882, to maintain such lights on them as may be required by the Light-House Board for the security of navigation. The Board in due time, and after careful examination and preparation, issued a set of regulations for lighting such bridges, fully illustrated by diagrams. Persons operating such bridges have, however, obeyed these regulations only so far as they have chosen. The Board, having been unable to induce full compliance with its rules, made a test case of the most important instance of failure to comply with its regulations, and reported the matter through the proper channels to the Department of Justice for legal action. The United States attorney to whom the matter was assigned reported in effect that he could accomplish nothing by prosecution, as "the statute prescribes no penalty for its violation and gives no remedy or means for its enforcement."

The United States attorney further states:

"That it is a common-law rule that when a statute forbids or requires an act to be done, an indictment will lie against an offender if the matter involved is one of public concern, but it is a familiar principle of Federal practice that crimes and their penalties must be the subject of specific Federal legislation, and recourse to common-law principles are therefore futile. It seems to me therefore * * * that, in order to remedy the evils to safe navigation in the East River by reason of improper lights upon the Brooklyn Bridge, * * * Congress must pass an act prescribing a punishment for disobedience to the orders of the Light-House Board."

It is therefore submitted that the proper steps should be taken to obtain the suggested legislation.

NECESSARY NEW STRUCTURES.

The following recommendation, made in the Board's annual report for each year since 1887, is renewed:

For several years past the Board has included in its annual estimates of appropriations, under the head of repairs and incidental expenses of light-houses, a clause stating that the objects of the appropriations are to be considered as "including necessary new structures" (see Book of Estimates, 1888-'89, p. 203). The object of this is to sanction a practice which has prevailed since the foundation of the Light-House Establishment until quite recently, viz, the erection at established stations, as the needs of the service may require, of additional structures of small cost from the current annual appropriations. The clause in question has, however, been cut out by the Committee on Appropriations of the House of Representatives from year

to year, to the great embarrassment of the service, as under such circumstances the auditing officers are of the opinion that any improvements involving a new structure can not be made, no matter how much it may be needed, or how insignificant the cost may be. This tends to defeat one of the objects for which the appropriation is made, viz, to keep the service in efficient practical working order, and to adapt it to the changing necessities of commerce. It is therefore respectfully asked that steps may be taken to urge Congress to include in the appropriation bill for the coming year the clause in question.

SUPPLIES OF LIGHT-HOUSES.

The appropriation for 1892 was \$370,000, but while the appropriation was decreased \$5,000, the number of light-stations was increased, and it is reasonable to expect that appropriations will be made during the next session of Congress for still other light-stations.

Heretofore certain articles of light-house supply not manufactured in this country were imported duty free. Under the present tariff act duties must be paid on them. An estimate therefor, of \$25,000 was submitted at the last session of Congress, but while it passed one House it failed in the other. The necessity of paying these duties will be an additional drain upon this too slender appropriation. The small amount appropriated for supplies by the last Congress made it impossible for the Board to keep up its reserve stock of supplies with which to meet emergencies. This stock has been drawn upon to a large extent. The meagerness of preceding appropriations has made it necessary for the Board to scale down the quantity of supplies furnished yearly to the light-houses to such a point that it can go no further without danger that the lights may be extinguished. The severest economy was practiced last year and is being used this year, and as the number of lights has increased it is feared that the present lights and those which are being built can not be kept up from the current appropriation. The passage of the eight-hour law will enhance the price of all manufactured material used to supply light-houses, but to what amount the Board is not as yet able to determine. The Board therefore estimates that \$408,000 will be needed for the fiscal year to end on June 30, 1894.

SALARIES OF LIGHT-HOUSE KEEPERS.

Last year Congress appropriated \$660,000 to pay not exceeding 1,250 keepers. The amount has been expended and it was only sufficient to pay the keepers of lights existing when the appropriation was made. Some of the light-houses built since then are therefore without keepers. Light-houses already authorized and appropriated for by Congress can not be lighted unless sufficient appropriation is made under this head to provide them with keepers.

It has become necessary, in view of the great pressure on this appropriation, to temporarily omit filling certain vacancies as they occurred, where there was more than one keeper at a station. This has necessarily resulted in inferior service on the part of the overworked keepers re-

maintaining at those stations. Two men can not do the work of three properly for any extended term.

The duties of light-keepers have been greatly increased by the addition of steam fog-signal apparatus, requiring, in many cases, the attention of steam engineers. It has been found that it is impossible to obtain the services of men for many of these positions, for the pay offered, who hold certificates that they have passed examinations as steam engineers. Hence the Board has been unable to get the best results from its steam fog signals. The steam is not raised as soon as it might be so as to get the fog signal to sounding as soon as it should. The machinery gets out of order sooner than it would if in the charge of a skilled engineer. It remains out of use until a machinist is sent from a distant town at large expense in wages and transportation to fix it, and the life of the machine is much shorter than it would be if in the charge of a certificated engineer. It is poor economy to stint the pay of engineers to such point that the services of only the poorest can be commanded, as it costs so much to remedy the mistakes they unavoidably make.

It has been found in practice that it is difficult to retain in the service men of sufficient experience and ability to operate and take the proper care of the delicate, complicated, and expensive illuminating apparatus placed in their charge. Hence it costs more than it formerly did, and more than it ought, to keep this apparatus in running order. The Board therefore suggests that it would be better, from an economical point of view, to raise the average salary of the light-keeper to the amount fixed by law rather than to maintain it at its present rate, and especially to decrease it still more. But to supply light-keepers of the present grade of ability in sufficient numbers to man the light-houses built and to be built within the coming fiscal year will require an appropriation of \$680,000.

EXPENSES OF LIGHT-VESSELS.

There were, on June 30, 1892, thirty-six light-vessels on duty. Four of the old light-vessels have been replaced by newly built light-vessels, each of which will have a steam fog signal, and each of which will cost much more to maintain than did each of the old vessels. The last appropriation made for this purpose (\$250,000) will not maintain these thirty-six light-ships and keep them in proper condition of repair so as to warrant their use in the exposed positions, where most of them must be placed. The result will be that at the end of the current fiscal year it will cost much more to put them in good order than it would have done if repairs had been made as soon as it was evident that they were needed.

The four mentioned new light-vessels, built from special appropriations made therefor, are now on their respective stations. Last year five additional light-vessels were built and placed on their stations. Most of these new light-vessels have taken the place of old, obsolete

vessels. Each of the new vessels is fitted with propellers, steam fog-signal apparatus, and with new improved lighting apparatus. Hence, it will cost at least \$3,000 a year more to maintain each of these new vessels than it did to maintain each of the old vessels which they replace. The old vessels will be kept in the service as long as they can be economically, that they may be used to replace the new vessels when they are brought in for repair. Now the Board frequently is forced to replace a light-vessel with a lighted buoy if it has one, otherwise with an unlighted buoy. This can be avoided in the future. But meantime the Board has to maintain nine more first-class light-vessels than formerly.

The Board has built during the past year three small inexpensive light-vessels, for lake use, only during the season of navigation. Each has sufficient steam power for getting to and from her station, and each has a steam fog signal and lights of a sufficient range for her location. They are called light-ships Nos. 55, 56, and 57, and have been placed respectively on Simmons Reef, White Shoal, and Grays Reef, in Lake Michigan, and give satisfaction. It costs \$4,000 per year to maintain each of these vessels. This experiment of attempting to use inexpensive light-ships instead of costly permanent light-houses is tried at the earnest request of the lake vesselmen. Such small vessels would, however, be entirely inadequate for the boisterous weather and heavy sea of the Atlantic and Pacific coasts of the United States.

The Board was authorized to build a light-house on Eleven-Foot Shoal, Green Bay, Lake Michigan, by the act approved on August 30, 1890, in which \$60,000 was appropriated for the purpose. The sundry civil appropriation act, approved on August 5, 1892, authorized the Board to use this sum in providing one or more light-vessels for use on the Great Lakes. By another clause in the same act, \$25,000 was appropriated for placing a light-vessel at Bar Point, Lake Erie. It is now expected that five light-vessels can be provided from these appropriations. Plans for them are now being made. Four of them are to be built of wood, to be about 80 feet long, with 20-foot beam, and are to draw not more than 8 feet of water. They are to have steam fog signals, but are not to have self-propelling power. The ship for Bar Point is to be built on similar lines, but will be larger. It is not expected that such lightly built vessels can last nearly as well or as long as those built according to the Board's standard. But it is expected that they can be kept in commission until Congress has opportunity to determine whether they are to be replaced with light-houses, which would be more economical in the long run, or whether they are to be replaced by light-vessels of a permanent character.

These five new light-vessels are to be ready for use in the spring of 1893, at the opening of navigation. It will cost \$4,000 per year to maintain each of them. This is an addition of \$20,000 a year to the expenses of light-vessels over last year, and over three-fourths of the current year.

It is in view of all these additional expenses that the Board recommends that an appropriation of \$300,000 be made for expenses of light-vessels during the next fiscal year.

BUOYAGE.

There are now a larger number of buoys in use in United States waters than ever before. The electric buoys and gas buoys are used instead of light-houses, as they cost much less, and for the places in which they are used they are sufficiently effective. But while they cost much less than light-houses, they cost very much more than ordinary buoys. The whistling buoys and bell buoys are used instead of steam fog signals on submarine foundations, as they cost much less and answer the purpose for which they are used; but while they cost very much less than such fog signals they cost very much more than ordinary buoys. The Board has heretofore kept a reserve stock of buoys on hand with which to meet emergencies. That stock has now run very low and must be largely replenished. The amount estimated, however, is only sufficient to enable the Board to maintain the buoys now in use, without replenishing the reserve stock and without placing new ones, in answer to the many and urgent calls for them.

LIGHTING RIVERS.

No appropriation made by Congress accomplishes as much, so promptly, and with such satisfaction to its immediate beneficiaries, as that for lighting rivers. There are now about 1,705 lights maintained, at a cost of about \$166 per year for each. They have revolutionized steamboat navigation, making it almost as easy and as safe to run by night as by day, while before the system of river lighting was established it was usual for steamers to stop running and tie up to the banks during dark nights.

Not only is time now saved to steamboats by these lights, but there is a direct saving of money to both owners and shippers in shortening the time in which trips are made, in reducing rates of freight and insurance, and in reducing the liability of the boats to disaster. The tonnage on the great western rivers on June 30, 1892, was 310,802.68 according to the Bureau of Navigation.

The appropriations made for lighting rivers and the number of lights shown on the rivers for the last six years are shown in the following table:

Year.	Appropriation.	Number of lights.
1887.....	\$190,000	1,258
1888.....	225,000	1,422
1889.....	250,000	1,577
1890.....	254,000	1,581
1891.....	280,000	1,674
1892.....	283,000	1,705
1893.....	280,000	*1,761
1894.....	† 350,000	‡ 1,900

* Authorized.

† Asked.

‡ Needed on thirty rivers.

Thus it will appear that some 1,705 lights were maintained during the fiscal year which ended June 30, 1892, from an appropriation of \$283,000, and as the appropriation was all expended, it cost on an average about \$166 to maintain each light for the year. But the Board was unable to establish all the lights on these rivers which were demanded and needed by their increasing commerce, and it was also forced to discontinue certain existing lights that it might make its appropriation for lighting rivers last until the end of the year.

The following is a statement of the names of the rivers lighted during the fiscal year which ended on June 30, 1892, the number of miles lighted on each, and the number of lights exhibited on each:

Names.	Distance lighted.	Number of lights.
	<i>Miles.</i>	
Thames River, Connecticut.....	13	18
Connecticut River, Connecticut.....	42	24
Hudson River, New York.....	153	30
East River, New York.....	15	9
Raritan River, New Jersey.....	5	3
Delaware River, Pennsylvania.....	130	7
Elk River, Maryland.....	9	2
Cape Fear River, North Carolina.....	23	20
Savannah River, Georgia.....	15	7
St. Johns River, Florida.....	166	81
Indian River, Florida.....	125	29
Red River, Louisiana, at mouth of.....	9	7
Chicot Pass and Grand Lake, Louisiana.....	70	6
Mississippi River.....	1,943	780
Missouri River.....	179	31
Ohio River.....	966	453
Tennessee River.....	226	37
Illinois River.....	216	41
Great Kanawha River.....	74	34
Sacramento River, California.....	5	1
San Joaquin River, California.....	3	2
Columbia River, Oregon.....	86	38
Willamette River, Oregon.....	10	10
Puget Sound and Washington Sound, Washington.....	265	30
Total.....	4,748	1,705

From this it will be seen that some 4,000 miles on twenty-seven rivers were lighted by 1,705 post lights, at an expense of \$283,000, or an average cost of about \$166 per light per year.

On July 1, 1891, there were 1,674 river lights maintained by the Light-House Establishment, and the appropriation made for lighting rivers for the fiscal year ending on that date was \$280,000. On July 1, 1892, there were 1,705 river lights, and the appropriation for maintaining them for the year ending on that date was \$283,000. The increase in the number of lights was 31. The appropriation for the expense of lighting rivers for the fiscal year which is to end on June 30, 1893, is but \$280,000. The previous appropriation was entirely spent during the year for which it was made. Hence the Board has been unable to increase the number of lights since June 30, 1892, and there is reason to fear that it will be unable to keep up the number with which it commenced the fiscal year. The average cost of maintaining each river light during the year which ended June 30, 1891, was \$167; the cost was reduced during the last year by severe economy to \$166,

but it is feared that the low rate can not be maintained except at the expense of the efficiency of the service. If, therefore, the Board shall fail to heed the demands of the river commerce for the establishment of yet other lights, it will be understood that it is because the Board, after having stretched its resources to the uttermost, finds itself unable to do so.

Congress, during its last session, by the act approved on August 5, 1892, appropriated for the year which will end on June 30, 1893, \$280,000 to pay the expenses of maintaining lights on the twenty-seven named rivers. Certain of them are in Eastern States, where the maintenance of lights is more expensive than in any other part of the country. The additional lights which have already been asked for by those representing the river commerce, and the establishment of which has already been recommended by the local light-house officers, will, if granted, make a total of about 1,900 river lights.

ELECTRIC LIGHTS FOR LIGHT-SHIPS.

On October 28, 1890, the naval secretary, Commander G. W. Coffin, U. S. Navy, addressed a letter to the Light-House Board on the subject of introducing flash and revolving characteristics into the light-ships of the Light-House Establishment, and stated that there were at Staten Island two English revolving-light apparatus for light-ships, which had been purchased by the Board some years previously and had remained unused. The Board was then designing a number of light-ships, and he suggested that that was an opportune time to consider the subject. He proposed that the new light-ship building for Sandy Hook be fitted with one of these revolving lanterns. He also suggested that the new light-vessel for Cornfield Point, Long Island Sound, be fitted with a plant for electric flashing lights, and that the vessels building for Fenwick Island Shoal and Martins Industry be arranged to show the revolving light by a method of revolving shade before the lens.

This subject was brought to the attention of the Board at its meeting of the 5th of November, 1890, in the mean time it having been referred to the committee on floating aids. That committee reported that, in its opinion, every light, and especially every light-ship, should, as far as is practicable, have such characteristics that it shows, first, that it is a Light-House Establishment light and not a private light, and, second, that its characteristic should identify the light itself; and the committee recommended that the English revolving light then in store at the general depot be placed on the light-ship then building for Sandy Hook station, in form and manner as suggested by the naval secretary, and as soon as practicable. The committee also recommended that the light-ship for Cornfield Point, Long Island Sound, be fitted with electric flashing lights, in form and manner as suggested by the naval secretary, without undue delay. The recommendation with regard to the new light-ships for Fenwick Island Shoal and Martins

Industry was also concurred in by the committee, and the committee finally recommended that the executive officers of the Board be instructed to formulate a project for placing distinctive lights on all remaining light-ships in the service as soon as it was found practicable to do so, and that they be authorized to take all the necessary measures for this purpose. The report of this committee was acted on and approved on the 5th of November, 1890, by the Board in session.

It was ordered at that meeting that the chairman of the Board be authorized to request any member of the Board to consult and advise with the experts of the Board at the general depot in reference to carrying into effect plans for using electric lights on light-ships.

In accordance with this order the chairman directed Commander G. W. Coffin, U. S. Navy, the naval secretary; Prof. T. C. Mendenhall, Superintendent U. S. Coast and Geodetic Survey, and a member of the Light-House Board; and Maj. David Porter Heap, Corps of Engineers, U. S. Army, engineer of the third light-house district, to confer and formulate plans and specifications for this purpose.

As a result of this action, plans and specifications were prepared, and after full consideration advertisements were issued for competitive bids to furnish such a plant as the Board had decided upon. The contract was awarded to the lowest bidders, and the plant was manufactured and delivered at the light-house depot at Staten Island, where it was set up and put into effective operation under an agreement that when Cornfield Point light-vessel, No. 51, had been delivered at the general depot, the contractors were to install the plant on board the vessel and guarantee its effective operation. Sometime after the plant had been established at Staten Island and tested from time to time, the Staten Island Company, which furnishes the electric current for lighting the depot, was so unfortunate as to have its buildings burned. The light-ship plant was then put in operation, and, although such a test was unexpected, lighted the depot successfully for two months, and until the electric company replaced their works and furnished the usual electric light.

Cornfield Point light-ship, No. 51, was delivered at Staten Island in July, 1892, and accepted. As soon as possible thereafter the contractors installed the light-ship electric plant on that vessel, and upon the completion of their work the plant was operated for forty-eight consecutive hours and answered the requirements fully. This light-ship plant consists of four lens lanterns hung on gimbals in brackets permanently fastened to each masthead. There is a gallery on the mast at the proper distance below the lanterns for the convenience of the men who clean the lanterns. In each lantern is a 100-candle-power incandescent light. It is estimated that with the increased power due to the lenses of the lens lanterns, the four lanterns at each masthead will give a total light equal to 4,000-candle power. Maj. Heap devised an exceedingly simple apparatus by means of which the lamps are ex-

tinguished and lighted automatically at definite intervals. Thus the light will have the appearance of a flashing light, and it will only be necessary to light one mast at a time to distinguish the light-vessel from other vessels. Both masts are, however, fitted with lens lanterns, and the boilers, engines, and dynamos are in duplicate, and are so arranged that either boiler may be used with either engine, either engine with either dynamo, and either dynamo can light either mast. Should the electric system break down in spite of all these precautions, the lanterns contain oil lamps which can be lighted in a few moments. But the lights will no longer be flashing, nor will they be so bright, but with so many precautions it is hardly possible that it will be necessary at any time to use the oil lights. The electric plant also lights up the cabin and other parts of the vessel with electricity, 16-candle-power lamps beings used. A sketch of the light-vessel and a description of the steam and electric-light plant are given in the annual report of the Board for 1891.

Maj. Heap has been indefatigable in watching the details, suggesting changes, and carrying into effective operation all the designs of the Board, and the result shows the efficient manner in which he has performed these duties.

The vessel is now being fitted out for her station and will shortly be placed thereon.

LANTERNS FOR LIGHT-VESSELS.

The light-ship lantern now in use on the larger vessels was designed by the Board in detail, and consists of an eight-sided copper and brass box, glazed on the sides. It contains eight lamps with reflectors. Its central part is a hollow brass cylinder surrounding the mast but not attached to it, so that it may be hoisted at night and lowered during the day into the lantern house on the deck, as formerly.

In accordance with an act of Congress, three light-ships were designed for the Great Lakes and built at Toledo, Ohio. But with the money appropriated only small vessels could be built, which could not carry with safety the heavy lanterns mentioned. It was therefore decided to use the lens lanterns hung on brackets on the mast. Three were placed on each mast, supported in the brackets and hung on gimbals. The brackets were fastened to a ring surrounding the mast, so that the three lens lanterns could be lowered into the lantern house in the same way as the ordinary light-ship lanterns. They have given entire satisfaction, are much lighter, and cost very much less than the heavier light-ship lantern spoken of. A set of three lanterns with brackets, gimbals, lamps, etc., complete, weighs about 700 pounds and costs about \$620, whereas the light-ship lantern spoken of as having been designed by the Board costs, complete, about \$1,100, and weighs about 3,000 pounds. It is thought that this system of using lens lanterns hung at the masthead may be advantageously used in larger

vessels to replace the heavier lanterns. The system provided for the light-ships of the Great Lakes was designed and manufactured at Staten Island, directly under the supervision of Maj. Heap, the engineer of the third district.

REVOLVING LIGHTS FOR LIGHT-VESSELS.

A light which suddenly shines forth and then is eclipsed is a much more characteristic light than one which shines steadily. This end is gained in a light-house and on the electric light-ship by the means heretofore described. To accomplish the same object on a light-ship where oil is used as the illuminant presents more difficulties. Various devices were suggested. One was a motor, designed by Mr. Julius E. Rettig, superintendent of construction of the Light-House Board, intended to be operated by compressed air, the air being first compressed into a tank by man power. This motor did not develop sufficient power unless the pumping was continuous. Secondly, an electric motor was used, but the trouble and uncertainty of getting sufficient electricity from any known battery caused this scheme to be abandoned. It was then proposed to get the necessary power from a small hot-air engine, using kerosene as fuel. But this was considered to involve too large an element of danger. Clockwork actuated by a weight was also tried. It worked fairly well, but had to be wound up every twenty minutes, and was rather a clumsy affair. Finally, it was suggested by the Board that a donkey boiler be put into the light-ships, and Maj. Heap, the engineer of the third district, was asked to provide a small engine to revolve the lights. The article required was found in the market—a pair of small engines used for the windlass of yachts. They are amply powerful, and can be regulated by a governor to run at any required speed, are inexpensive, and durable. The engines are bolted to the under side of the deck supporting the lantern house. They are thus out of the way and protected from the weather. They communicate motion to a vertical shaft by means of a worm gear. The shaft runs to the lantern, being supported on the mast, and revolves the lamps. A pair of engines with governor and worm gear, complete, costs about \$220. The English revolving clockwork run by weights costs, including duty, about \$435. Chance Brothers, of England, manufacture a spring clock, which costs, including duty, about \$1,100. The small engines are seen, therefore, to be much the better in every respect.

In accordance with the Board's directions of the 5th of November, 1890, one of the English revolving light apparatus was fitted to the new Sandy Hook light-ship. The other apparatus has been fitted to light-ship No. 16, which is the relief of the Sandy Hook light-ship. The latter vessel has been fitted, in place of the English clockwork, with the small pair of engines spoken of previously. The clockwork of the Sandy Hook light-ship will be removed as soon as possible and a pair of small engines fitted in their place.

The matter of occulting lights is discussed at length in Appendix No. 4, Report of Maj. David Porter Heap, Corps of Engineers, U. S. A., engineer of the third light-house district.

NEW LIGHT-SHIPS AND LIGHT-HOUSE TENDERS.

The Board has built during the past year five new light-ships and four new light-house tenders. The light-ships Nos. 50, 51, 52, 53, and 54, intended, respectively, for Columbia River Bar, off the coast of Oregon; Cornfield Point, in Long Island Sound, Connecticut; Fenwick Island Shoal, off the coast of Maryland; Frying-Pan Shoals, off the coast of North Carolina, and Martins Industry Shoal, off the coast of South Carolina, have been built and delivered. Each embodies in herself all needed modern improvements, moving by her own steam, having the best fog signal and having illuminating apparatus specially adapted to the location she occupies. The steam light-house tenders *Lilac*, *Columbine*, and *Amaranth*, have been completed and assigned, respectively, to the first light-house district, with headquarters at Portland, Me.; the thirteenth light house district, with headquarters at Portland, Oregon, and the eleventh light-house district, with headquarters at Detroit, Mich. The *Columbine* sailed from New York for the Pacific Coast October 30, 1892. The new steam tender *Maple* is expected to be completed in December next. She is intended for the fifth light-house district, with headquarters at Baltimore, Md. Every effort has been made to embody in these vessels such improvements as will adapt each in hull and machinery for its own special work. Attention is invited to an account given in an appendix to this volume of the *Maple*.

The Board has built during the past year three small inexpensive light-vessels for lake use only during the season of navigation. Each has sufficient steam power for getting to and from her station, and each has a steam fog signal and lights of sufficient range for her location. They are called light-ships Nos. 55, 56, and 57, and have been placed, respectively, on Simmons Reef, White Shoal, and Grays Reef, in Lake Michigan, and give satisfaction. This experiment of attempting to use inexpensive light-ships instead of costly permanent light-houses is tried at the earnest request of the lake vesselmen. Such small vessels would, however, be entirely inadequate for the boisterous weather and heavy sea of the Atlantic and Pacific coasts of the United States.

The Board was authorized by an item in the sundry civil appropriation act approved August 5, 1892, to use the \$60,000 appropriated on August 30, 1890, to build a light-house on Eleven-Foot Shoal, for establishing one or more light-ships on the Great Lakes. Appropriation of \$25,000 was also made in the act of August 5, 1892, for establishing a light-vessel at Bar Point, Lake Erie. Plans are now being made for building a number of wooden light-vessels without steam power or steam fog signals, which are to be about 80 feet long, 20 feet beam, and to draw some 8 feet of water. It is hoped that three if not four such

vessels can be built from this \$60,000 appropriation, and that one of the same general character, but larger, can be provided from the appropriation of \$25,000 for establishing a light-vessel at Bar Point. It is not expected that such lightly built vessels can have the life of the light-vessels built according to the standard of the Board, but it is hoped that they may be kept on duty until Congress has opportunity to determine whether or not they shall be replaced by light-houses which would be more economical in the long run, or by light-vessels of a more lasting character.

TECHNICAL BOOKS FOR THE LIGHT-HOUSE ESTABLISHMENT.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

From the organization of the Light-House Establishment until quite recently it has been the practice of the Board to buy such technical and professional books and periodicals as were needed, and to pay for them from the proper general appropriations. This course was taken with the permission of the Secretary of the Treasury, given in many cases previously in writing, and with the approbation of the accounting officers of the Department, as shown by their approval of the accounts rendered therefor by the purchasing officer of the Board. These purchases are now disallowed by the accounting officers.

It has been from the beginning the settled and authorized policy of the Board to maintain a technical library to aid its constructing officers in the performance of their duties. This library now contains more than 3,000 volumes, many costly, most of them rare, and some of them unique, at least in this country. This was found to be the case during the session of the International Marine Conference, when books were borrowed from this library for its use on the plea that they could not be found elsewhere.

Books bought to enable the Board to build a certain light-house or light-ship might be charged against the appropriation for building that structure; but such books, while bought to meet the needs of the Board in each case, are kept to meet all similar cases arising afterwards. Hence they should be paid for from the general rather than from special appropriations. Books thus obtained are placed in the Board's library, which is a lending library, open to all the engineers and inspectors of the sixteen light-house districts. By this method a book bought for one district officer is open to the use of all. This prevents duplication of books and saves much expense.

The Board, in order to keep abreast of the march of science in the highly scientific work for which it is responsible, has great need and makes large use of its library.

An appropriation of \$300 was made for this purpose last year, and it is recommended that the same amount be appropriated for the purpose for use during the coming year.

GAS BUOYS.

The buoy used is of the Pintsch pattern and patent. It is forged by a secret process without seam and holds compressed gas without perceptible loss, which burns with a steady flame and which is rarely extinguished from any cause, making a useful light. The gas buoy is sometimes used to replace, temporarily, a light-ship while the latter is under repair. It is sometimes used where a light ship can not be moored. A dangerous wreck in an important channel leading into New York had to be marked, and as the channel was too narrow to ad-

mit of a light-ship being placed near the wreck, a Pintsch gas buoy was used there satisfactorily, to the great advantage of shipping, for a considerable length of time and until the wreck had disappeared. The Board in 1891 placed a lighted gas buoy in the fairway of vessels going north and south, near to the wrecks of the steamer *Vizcaya* and the schooner *Hargraves*, off Barnegat Light, on the New Jersey sea-coast, where it served to keep vessels from running on to these wrecks. In the summer of 1892 it placed a gas buoy in Pollock Rip Slue, Mass., off the wreck of the yacht *Alra* which was also in the fairway of vessels going north and south. A gas buoy was also placed so as to mark a wreck in Boston Harbor, and the buoy was kept there until the wreck was broken up and disappeared.

There was no appropriation made by the last session of Congress for gas buoys. The year before, by the act approved on March 3, 1891, \$30,000 was appropriated for this purpose, but the Board was limited to the payment of not exceeding \$2,000 each, for gas buoys. This provision precluded the purchase of many of the larger class. The buoy, which the Board has used so successfully for the past six or seven years, weighs about 6,000 pounds and costs about \$2,000 on the other side of the Atlantic, where only it is made. The duty upon it is about 45 per cent ad valorem. That amount, with the freight, would make each buoy, of the size most wanted, cost about \$3,000 delivered at the general light-house depot.

As the Board was not able to get the buoys most needed, the amount was expended in the purchase of a smaller class of buoys which can be used in the stiller waters of the sounds and the lakes. Ten more gas buoys of the larger sizes are needed. The Board estimates that they will cost \$30,000, and it is recommended that an appropriation of this amount be made for that purpose.

ILLUSTRATION OF THE LIGHT-HOUSE LIST.

Mariners have complained that they were unable to determine, from the description in the light-house list, the identity of the light-stations by day, when the lights were not burning. The Board has therefore added to the descriptive narration in the light-house list, graphic representation. Cuts of prominent lights in the first and second light-house districts were added to the light-house list for 1891, and in those for 1892 cuts of the most prominent lights on the Atlantic, Gulf, and Pacific coasts were given. Those stations have been selected which could most readily be mistaken, especially at a distance, for others, and photographs of them were made from the point of view from which mariners would first see them. From these photographs the cuts were made. The pictures had to be obtained at small cost, and hence they can have little artistic merit. But they answer the designed purpose so well that the Board is encouraged to add to the next light-house list pictures of still other lights. It is claimed that these cuts make the light-houses figured almost as useful to mariners by day as they are by night.

INSPECTING LIGHTS.

The Light-House Board consists of nine persons. Each member is supposed to be an expert in some branch of pharology, and for that reason he is detailed to this duty. His value to the service increases as he comes in personal contact with the local light officers while in performance of their duty, and this can be accomplished only by actual journeys to the various districts. The theory is that light-house inspectors and engineers inspect the light-houses, light-ships, light-house and buoy depots and their appurtenances, and that the members of the Light-House Board inspect the work of the inspectors and engineers. In proportion as this theory is carried into effect uniformity and precision of action is insured. Proper inspection by members of the Board is, however, limited by the fact that their mileage, or traveling expenses, can be paid only from the \$3,000 appropriation made yearly for inspecting lights. Small as this appropriation is, it is burdened by the provision that from it must be paid the rewards offered for information as to collisions and for the apprehension of those who have damaged light-house property. It is therefore recommended that this amount be increased to \$5,000 for the coming year, or that the Board be authorized to pay its members' mileage or traveling expenses from the several general and special appropriations to which the travel may pertain.

INTERNATIONAL UNIFORM BUOYAGE.

When the International Marine Congress was in session in Washington in 1889, it considered, at the instance of the Light-House Board, the subject of international uniform buoyage. The matter was referred, with suggestions, to the several countries concerned. It then became the subject of diplomatic correspondence between Great Britain and the United States, and has again and more fully received the action of the Light-House Board. The details of this correspondence will be found in an appendix to this volume. The Board is of opinion that too much attention can not be given to this important subject.

PERSONNEL.

The following changes have taken place in the personnel of the Light-House Board since the date of the last annual report:

On February 17, 1892, Brig. Gen. Thomas Lincoln Casey, Chief of Engineers, U. S. Army, was relieved at his own request, and was succeeded by Lieut. Col. George H. Elliot, Corps of Engineers, U. S. Army. On May 14, 1892, Col. William P. Craighill, Corps of Engineers, U. S. Army, was relieved at his own request, and was succeeded by Maj. Oswald H. Ernst, Corps of Engineers, U. S. Army. On December 4, 1891, Maj. James F. Gregory, Corps of Engineers, U. S. Army, was detached, and was succeeded by Capt. Frederick A. Mahan, Corps of Engineers, U. S. Army, who had been detailed for temporary duty as engineer secretary during the absence abroad of Maj. Gregory.

ESTIMATES FOR GENERAL APPROPRIATIONS.

Supplies of light-houses.....	\$408,000.00
Repairs of light-houses.....	710,427.99
Salaries of keepers of light-houses.....	680,000.00
Expenses of light-vessels.....	300,000.00
Expenses of buoyage.....	425,000.00
Expenses of fog signals.....	110,774.83
Inspecting lights.....	5,000.00
Lighting rivers.....	350,000.00
Survey of light-house sites.....	1,000.00

ESTIMATES FOR SPECIAL APPROPRIATIONS.

Absecon buoy depot, New Jersey, completion, etc.....	\$2,000.00
Alligator River light-station, North Carolina.....	20,000.00
Ames Ledge light-station, Kennebec River, Maine.....	75.00
Baltimore light and fog-signal station, Maryland.....	60,000.00
Ballards Reef light and fog-signal station, Michigan.....	100,000.00
Bayfield light-station, Lake Superior, Wisconsin.....	5,000.00
Bay State Shoal and Oak Point Shoal, Lake Ontario, New York, temporary floating lights.....	800.00
Beaufort Harbor range lights, North Carolina.....	10,000.00
Big Bay Point light and fog-signal station, Lake Superior, Michigan...	25,000.00
Big Oyster Beds light and fog-signal station, New Jersey.....	25,000.00
Big Sable fog signal, Lake Superior, Michigan.....	5,500.00
Black Ledge light and fog-signal station, Connecticut.....	45,000.00
Black River or Lorain fog signal, Lake Erie, Ohio.....	4,300.00
Bodega Head light and fog-signal station, California.....	30,000.00
Boon Island, keeper's dwelling, Maine.....	3,400.00
Boston Harbor light-ship, Massachusetts.....	70,000.00
Bridgeport light-station, Connecticut.....	2,000.00
Butler Flat light and fog-signal station, Massachusetts.....	45,000.00
Cape Elizabeth, keeper's dwelling, Maine.....	3,300.00
Cape Fear light-station, North Carolina.....	150,000.00
Cape Fear River range lights, North Carolina.....	3,105.00
Cape Flattery fog signal, Washington.....	17,000.00
Cape Lookout Shoals light-ship, North Carolina.....	70,000.00
Cape May boathouse, New Jersey.....	800.00
Cape Mendocino light-station, California (roadway).....	500.00
Carlton Island light-station, Lake Ontario, New York.....	8,600.00
Cedar Point light and fog-signal station, Maryland.....	25,000.00
Cheboygan River front range light, Straits of Mackinac, Michigan (additional land).....	1,750.00
Chequamegon Point light and fog signal, Lake Superior, Wisconsin....	10,000.00
Chicago Fair buoyage, Illinois.....	29,500.00
Chicago Harbor light and fog-signal station, Illinois (completion).....	15,500.00
Clark Ledge light and fog-signal station, Maine.....	30,000.00
Deadman Island light and fog-signal, San Pedro Harbor, California....	5,000.00
Deer Point light-station, Pensacola Bay, Florida.....	1,000.00
Depot for ninth and eleventh light-house districts, Scammons Harbor, Michigan.....	15,000.00
Devils Island, Apostle Group, Lake Superior, Wisconsin, permanent tower.	22,000.00
Doboy Sound range lights, Georgia.....	1,500.00
Dog River Bar light-station, Alabama.....	20,000.00
Dollers Point and Hog Island Wharf range lights, James River, Virginia.	2,500.00
Doubling Point light and fog-signal station, Kennebec River, Maine....	6,300.00

Eagle Harbor fog signal, Lake Superior, Michigan	\$5,500.00
Eagle River light-station, Lake Superior, Michigan, moving light to Sand Hills	20,000.00
Escanaba fog signal, Lake Michigan, Michigan	1,100.00
Fairport fog signal, Lake Erie, Ohio	4,700.00
Fourteen-Mile Point light and fog signal, Lake Superior, Michigan	20,000.00
Forty-Mile Point light and fog-signal station, Lake Huron, Michigan ..	25,000.00
Fort Wadsworth light and fog-signal station, New York, moving from Fort Tompkins	1,500.00
Galloo Island fog signal, Lake Ontario, New York	5,700.00
Gas buoys	30,000.00
Gladstone light-station, Lake Michigan, Michigan	10,000.00
Grand Marais light and fog signal, Lake Superior, Michigan	15,000.00
Grassy Point range lights, Maumee Bay, Lake Erie, Ohio	8,000.00
Grays Harbor light and fog-signal station, Washington	60,000.00
Green Island light-station, Maine	12,000.00
Heron Neck, keeper's dwelling, Maine	3,300.00
Hillsboro Inlet light-station, Florida	90,000.00
Hog Island Shoal light-ship, Rhode Island	70,000.00
Hog Island light-station, Virginia (to change light from fourth to first order)	125,000.00
Inside Passage beacon lights, Georgia and Florida	4,000.00
Key West light-station, Florida, additional for increasing height of tower	1,500.00
Lazaretto Point depot, dwelling for keeper, Maryland	2,500.00
Libby Islands, keeper's dwelling, Maine	3,200.00
Little Gull Island light and fog-signal station, Lake Michigan, Michigan	20,000.00
Little River fog-signal station, Maine	10,500.00
Ludington fog signal, Lake Michigan, Michigan	5,500.00
Ludington Pierhead light and fog-signal station, Lake Michigan, Michigan, keeper's dwelling	4,500.00
Manistique light and fog-signal station, Lake Michigan, Michigan	32,000.00
Manitowoc fog signal, Lake Michigan, Wisconsin	5,500.00
Marrowstone Point fog signal, Puget Sound, Washington	3,500.00
Mary Island light-station, Alaska	800.00
Matinicus Rock, keeper's dwelling, Maine	3,200.00
Maumee Bay range lights, Ohio	4,100.00
Menasha range lights, Wisconsin	500.00
Mendota light-station, reestablishment, Lake Superior, Michigan	7,500.00
Mermonteau River light-station, Louisiana	7,000.00
Mobile ship channel lights, Alabama	60,000.00
Mount Cornelia light-station, Florida	175,000.00
New York Slough light and fog-signal station, California	10,000.00
North Head Cape Disappointment light-station, Washington	50,000.00
North Manitou light and fog-signal station, Lake Michigan, Michigan ..	20,000.00
Oil houses for light-stations	15,000.00
Old Mackinac Point light-station, Straits of Mackinac, Michigan, additional land	1,000.00
Old Orchard Shoal light-station, New York, additional	300.00
Oswego Breakwater fog signal, Lake Ontario, New York	4,300.00
Patrol steamer, hire of, for use on the St. Marys River, Michigan	4,000.00
Pate (or Hat) Point light and fog signal, Lake Superior, Minnesota	15,000.00
Perkins Island light-station, Kennebec River, Maine	5,700.00
Peahtigo Shoal light and fog-signal station, Wisconsin	10,000.00

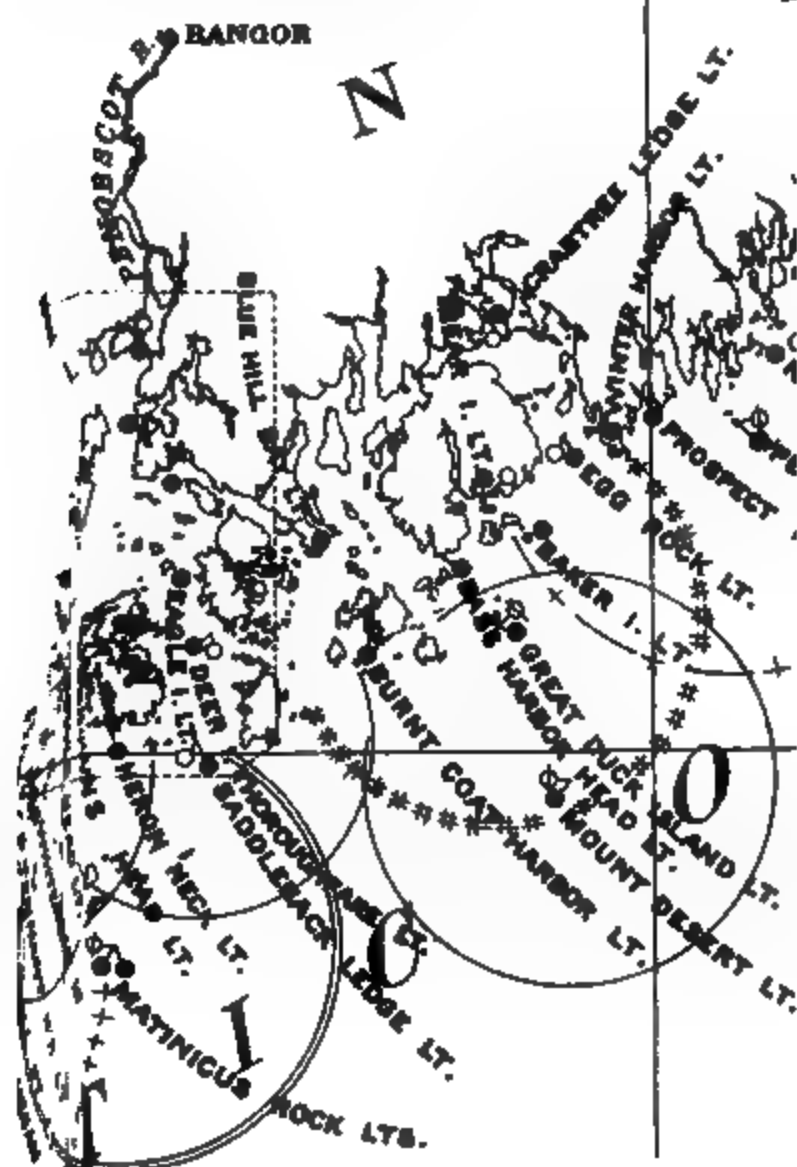
Plum Beach light and fog-signal station, Rhode Island	\$60,000.00
Poes Reef light-ship, Straits of Mackinac, Michigan	25,000.00
Point Arguello light and fog-signal station, California	35,000.00
Point Buchon light and fog-signal station, California	33,000.00
Point Hueneme light-station, California, additional land	1,000.00
Point No Point light-station, Chesapeake Bay, Maryland	35,000.00
Point Pinos light-station, California, additional land	2,000.00
Pork Point light and fog-signal station, North Carolina	20,000.00
Port Clinton light-station, Lake Erie, Ohio, reëstablishing	1,500.00
Portage Lake Ship Canal pierhead fog signal, Lake Superior, Michigan	5,500.00
Portage Lakelight-station, Lake Michigan, Michigan, keeper's dwelling	3,500.00
Porte des Morts range lights and fog-signal station, Lake Michigan, Michigan	21,000.00
Presque Isle Pierhead fog signal, Erie Harbor, Lake Erie, Pennsylvania	4,300.00
Puget Sound beacon lights, Washington	10,000.00
Punta Gorda light and fog-signal station, California	40,000.00
Quarry Point fog-signal station, San Francisco Bay, California	6,000.00
Rockland Lake light and fog-signal station, New York	35,000.00
Round Island, North Passage, Mission Point, Mackinac Island, Lake Huron, Michigan	15,000.00
St. Catherine Sound light-station, Georgia	20,000.00
St. Joseph Pierhead fog signal, Lake Michigan, Michigan	5,000.00
St. Joseph Point light-station, Florida	25,000.00
St. Martin Island light and fog-signal station, Green Bay, Michigan	15,000.00
St. Marys River, the more thorough lighting, Michigan	145,562.00
Salem Creek light-station, New Jersey	800.00
Seul Choix Pointe light and fog signal, Lake Michigan, Michigan, completing structures	3,500.00
Seul Choix Pointe fog signal, Lake Michigan, Michigan	5,500.00
Sheboygan Pierhead fog signal, Wisconsin	5,500.00
Sheffield Harbor light-station, Connecticut	10,000.00
South Bass Island light-station, Lake Erie, Ohio	8,600.00
South Boston range lights, Boston Harbor, Massachusetts	1,000.00
South Fox Island fog signal, Lake Michigan, Michigan	5,500.00
Spectacle Island range lights, Boston Harbor, Massachusetts	9,350.00
Spring Point Ledge light and fog-signal station, Portland Harbor, Maine	45,000.00
Squirrel Point light-station, Kennebec River, Maine	4,650.00
Staten Island light-house depot, New York, sea wall, etc	75,000.00
State Ledge light and fog-signal station, Massachusetts	42,000.00
Statue of Liberty light-station, New York Harbor, New York, completing pedestal	50,000.00
Sturgeon Bay Canal light-station, Lake Michigan, Wisconsin	20,000.00
Swan Point Bar light and fog-signal station, Maryland	50,000.00
Tender for the third light-house district	95,000.00
Tender for the ninth light-house district	95,000.00
Tibbetts Point fog signal, Lake Ontario, New York	4,300.00
Two-Bush Island light and fog signal, Penobscot Bay, Maine	19,000.00
Waackaack light-station, New Jersey, additional	3,730.00
Warwick fog-signal station, Rhode Island	5,000.00
Willamette River light and fog-signal station, Oregon	6,000.00
Wilson Harbor light-station, Lake Ontario, New York	2,500.00
Wreck Point light-station, North Carolina	5,000.00
Yaquina Bay lights, Oregon	300.00

T. H. DISTRICT

Statute Miles



Nautical Miles



Note

The different varieties of Lights and Fog Signals are designated by the following characters:

- Fixed White
- ... Fixed Red
- Flashing White
- Flashing Red
- Fixed White varied by White Flash
- ... Fixed White varied by Red Flash
- Fixed White varied by Red & White Flash
- Flashing Red & White
- Double Light
- ⚡ Lights building or to be built
- ⚡ Fog Signals operated by steam or hot air
- ⚡ Fog Bells struck by machinery

The Ranges of Visibility are indicated only for some of the lights.



FIRST DISTRICT.

The first district extends from the head of navigation in the St. Croix River, Maine, the eastern boundary of the United States, to and including Hampton Harbor, New Hampshire, and includes all the aids to navigation on the coasts and in the navigable bays, rivers, and inlets of Maine and New Hampshire.

Inspector.—Commander Frank Wildes, U. S. Navy.

Engineer.—Maj. William S. Stanton, Corps of Engineers, U. S. Army, to December 14, 1891; Maj. William R. Livermore, Corps of Engineers, U. S. Army, from December 14, 1891.

In this district there are—

Light-houses and beacon lights.....	61
Day or unlighted beacons.....	104
Fog signals operated by steam or hot-air engines.....	12
Fog signals operated by clockwork.....	17
Whistling buoys in position.....	11
Bell buoys in position.....	16
Other buoys in position.....	606
Steamer <i>Iris</i> , buoy tender and for supply and inspection.....	1
Steamer <i>Myrtle</i> , for construction and repair in the first and second districts....	1

The number preceding the name of a light-station is that by which it is designated in the list of lights and fog signals on the Atlantic and Gulf coasts of the United States, corrected to January 1, 1892, or in the list of lights and fog signals on the Pacific coast of the United States, corrected to January 1, 1892, or in the list of lights and fog signals of the United States on the Northern lakes and rivers, corrected to the opening of navigation, 1892.

This district contains 57 light-stations, with 59 lights, 2 beacon lights, and 1 independent fog signal. Of these stations 28 are provided with fog signals. Seventeen of these signals are bells struck by machinery, 8 of them are operated by steam, and 3 of them are worked by hot-air engines. The independent fog signal of Manana Island is run by hot air. There are in position 104 day or unlighted beacons, 11 whistling buoys, 16 bell buoys, and 606 other buoys.

The buoy on Winslow Rock, Kennebec River, and two buoys in Sand Channel, Moosabec Reach, have been discontinued. One spindle has been set up. One can, 13 spar, and 1 bell buoys have been placed. The spar buoys on Stump Cove Ledge and Hay Island Ledge, in Eggemoggin Reach, have been changed to nun buoys.

The fog signal at Libby Islands has been changed from hot air to steam, and the signal at Mount Desert from a bell struck by machinery to a hot-air trumpet. The fog signal authorized last year for the Cuckolds, near Boothbay, is in process of construction.

First District.**LIGHT-HOUSES.**

— *Clark Ledge, St. Croix River, near Eastport, Maine.*—The following recommendation, made in the Board's last three annual reports, is renewed:

Vessels navigating the St. Croix River need a light to guide them to its entrance between the whirlpools off Deer Point and Dog Island, near Eastport. Clark Ledge, near the shore in Eastport Harbor, is almost covered at high water, is very dangerous to navigation, and has caused the loss of several vessels. A light here would serve the twofold purpose of guiding vessels to the entrance of the river and clear of this dangerous ledge. For this purpose an appropriation of \$30,000 is needed. The legislature of Maine, which convenes biennially and will not again assemble until the winter of 1890-'91, has conveyed title to the ledge and jurisdiction over it to the United States, so that the light-house may be erected whenever an appropriation therefor is made by Congress.

It is recommended that an appropriation of \$30,000 be made therefor.

3. *West Quoddy Head, entrance to Quoddy Bay, Maine.*—A brick oil house, 8 feet 6 inches by 8 feet 6 inches in plan, was built. A door was cut in the west side of the fog-signal house. Various minor repairs were made.

4. *Little River, mouth of Little River, Cutler Harbor, Maine.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

Cutler Harbor is a station of the Eastport, St. John, and Bay of Fundy pilots. It is rapidly growing as a summer resort. Vessels making the Bay of Fundy first make Libby Islands, and then try to make Little River light. Steamers of the International Line wish to make this a harbor and stopping place. They carry much freight and many passengers. It is the only near harbor of refuge, and is used as such by vessels when they can get in; but this is impossible in a fog, without the aid of a fog signal. The Spanish steamer *Eduardo* struck at low tide on July 21, 1889, on Old Man Island, 2 miles south of Cutler Harbor, at midnight and during a dense fog. She filled with water and proved a total loss. The crew, numbering 40 men in all, were saved. She registered 2,308 tons and cost \$285,000. The inspector of the first light-house district made a report relating to this wreck, from which the following extracts are taken:

"The steamer *Eduardo* arrived near Libby Islands light and fog-signal station on the morning of July 20, and remained in that vicinity until near midnight, occasionally standing out seaward and then returning, apparently keeping between the two signals of Libby Islands and Seal Island.

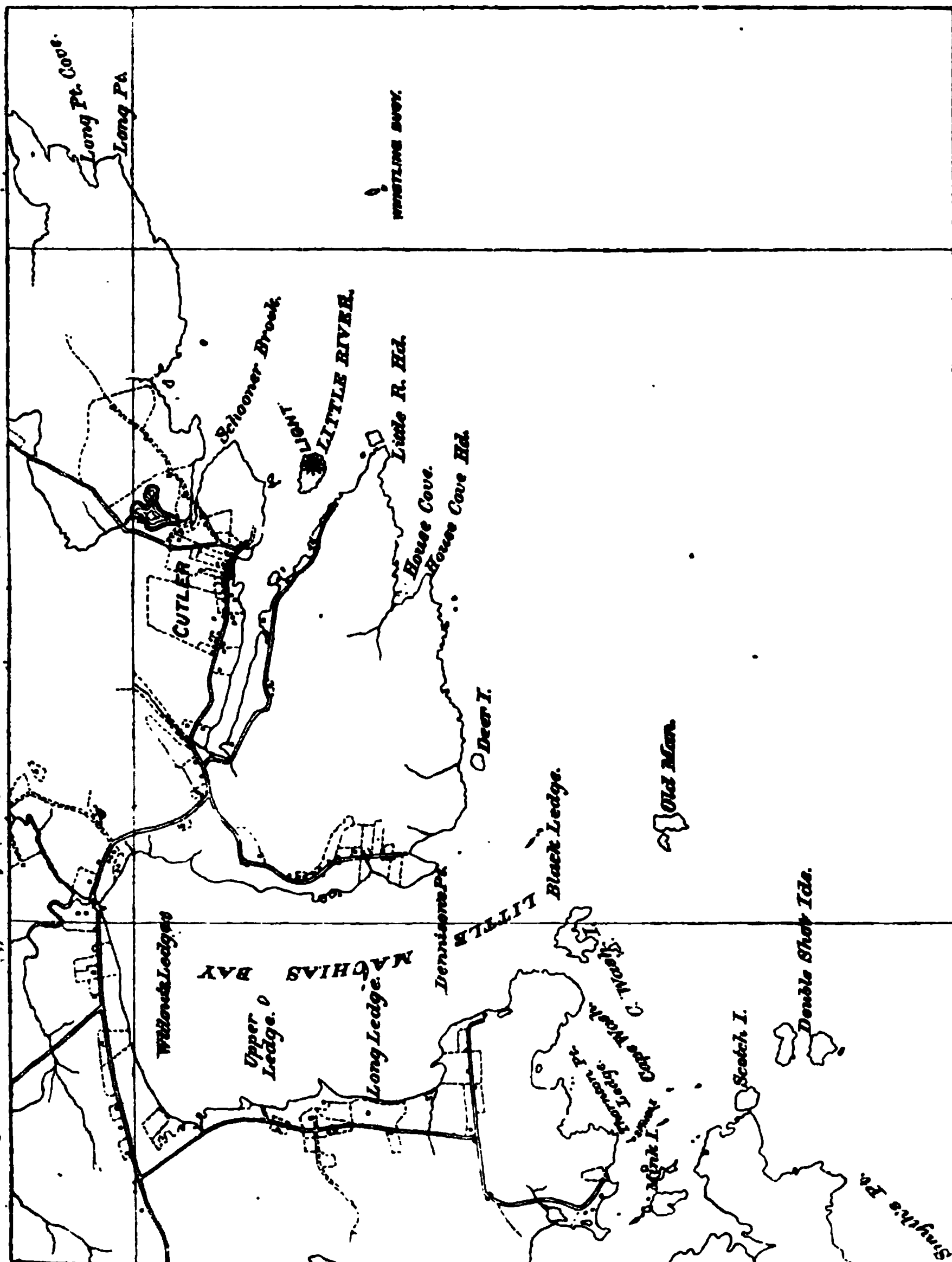
"The weather was calm, with a rough sea and dense fog. About 9 p. m. it scaled up so that Libby Islands and Moose Peak lights were visible, and soon after the vessel was headed east by north at slow speed, with frequent casts of the lead.

"At about midnight, fog being very thick, the vessel struck on Old Man, having heard neither the automatic fog bell of Little River light-station, $2\frac{1}{4}$ miles distant to the eastward, nor the whistling buoy off same place, $3\frac{1}{4}$ miles distant, bearing about E. $\frac{1}{4}$ N."

From an inspection of the chart it will be seen that Little River and Harbor opens to the southeast and that the high land of Little River Head covers the light-station until it is brought to bear about north. A steam fog signal at the light-station might or might not be heard near the Old Man; it would not be heard certainly at its full strength; but located on Little River Head it would be exposed in all directions sea-

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ward and would in this case, without any doubt, have been the greatest possible assistance in guiding the *Eduardo* to that point; the whistling buoy could then have been picked up and a fresh departure taken, or the vessel could have entered the harbor of Cutler.



The following is an extract from the report of her master of the wreck of the *Eduardo*:

"If at the western point of Little River there had been a fog whistle or trumpet, I assure you this accident would not have occurred; so that, in my opinion, it is abso-

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lutely necessary there should be at that point some fog signal operated by steam during foggy weather."

The Board is also of opinion that this wreck would not have occurred had the fog signal now recommended for Little River light-station then been in operation. It is estimated that the establishment of such a signal would cost \$10,500, and the appropriation of that amount is therefore recommended.

6. *Libby Islands, entrance to Machias Bay, Maine.*—A sea wall 46 feet long by 12 feet high, of 12-inch by 12-inch hard pine timber securely bolted to the ledge and reënforced with rocks, was built to protect the boatslip from the sea. A platform 18 feet by 6 feet in plan was built at the side of the boatslip. Minor repairs were made.

Since the establishment here of the fog signal by Daboll trumpet, about nine years ago, made the appointment of an assistant keeper necessary, the assistant has been intimately related to the principal keeper. For several years he was the brother of the keeper's wife, and thereafter until now the keeper's son-in-law was assistant keeper, and the families of the principal keeper and his assistant have lived together as one family in one dwelling. Recently the principal keeper resigned; the families of the keeper and his assistant, therefore, must live separately hereafter. The only dwelling at the station is adapted neither in size nor arrangement to two families, and another set of quarters has therefore become urgently necessary. The substitution this summer of the steam fog signal for the Daboll trumpet will make it more than ever necessary and important to have an efficient assistant, and the provision of a suitable set of quarters for him will make it much easier for the service to obtain and retain an assistant of the qualifications required. It is estimated that an additional keeper's dwelling can be built for \$3,200, and it is recommended that an appropriation of this amount be made therefor.

7. *Moosabec Reach, easterly entrance to Moosabec Reach, Maine.*—An iron ladder was attached to the spindle to give access to the lantern.

8. *Moose Peak, Mistake Island, entrance to Bay of Fundy, Maine.*—A brick oil house 8½ by 8½ feet in plan was built. Various minor repairs were made.

10. *Narraguagus, Pond Island, entrance to Narraguagus Bay, Maine.*—A barn 16 by 20 feet in plan, and a fuel house measuring 12 by 20 feet were rebuilt, and minor repairs were made to the dwelling. A brick cistern of 1,500 gallons' capacity was built in the cellar of the dwelling.

11. *Petit Manan, south end of Petit Manan Island, Maine.*—The steam fog signal, which was remodeled in the machine shop in Boston, was installed in place of the old signal. A new lens chariot, trucks, and friction rolls, made in the shop at Boston, were fitted. Various minor repairs were made.

12. *Prospect Harbor, entrance to Prospect Harbor, Maine.*—A frame dwelling 19 by 20 feet in plan, with ells each measuring 12 by 16 feet was built on the foundation of the old stone dwelling. A barn 16 by

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28 feet in plan was built to replace the old barn. A brick cistern was built in the cellar and the cellar floor was raised 2 feet to exclude water. The ground around the dwelling was graded to prevent the accumulation of water. A wire fence was built on the north boundary of the reservation. Various minor repairs were made.

13. *Winter Harbor, Mark Island, Maine.*—The boatslip was extended 15 feet and refastened.

14. *Mount Desert, Mount Desert Rock, Atlantic Ocean, off the coast of Maine.*—Work on the double dwelling for the keeper was done at the shop in Portland. The dwelling will probably be ready for occupancy in October. The first floor in the tower was removed. It was replaced by a strong floor of brick arches and iron beams. The caloric engines taken from Libby Islands were nearly rebuilt in the Board's machine shop at Boston and were set up at this station. Various minor repairs were made.

19. *Bear Island, about 5 miles northwest of Baker Island, Maine.*—Arrangements were made to build an addition to the northerly side of the approach to the wharf head which should be 52 by 100 feet in plan. At the close of the year about three-fourths of the material for the extension had been landed at the station, and the work was well advanced. The fog-bell striker was repaired.

20. *Bass Harbor Head, entrance to Bass Harbor, Maine.*—Some 93 feet of wire fence was built along the edge of the bluff from the tower to the road. Various repairs were made.

— *Green Island, entrance to Burnt Coat Harbor, Maine.*—The following recommendation, made in the Board's estimates and reports for the last seven years, is repeated:

Burnt Coat Harbor is an excellent, capacious harbor of refuge. The range lights which guided to the entrance were unsatisfactory, and a vessel was wrecked last year while trying to make the harbor by their aid. One of them was accordingly discontinued, and it is proposed to erect in its stead a light-house on Green Island, about a mile to the southward of the entrance. It is recommended that an appropriation of \$12,000 be made therefor.

24. *Heron Neck, on Green Island, East Penobscot Bay, Maine.*—The following recommendation, made in the Board's last annual report, is renewed:

The keeper's dwelling, built when the station was established in 1853, was designed to be an excellent one, having 8-inch brick walls separated by a 2-inch air space from a 4-inch brick lining and having interior 4-inch brick partitions. It is, however, understood to have been built by contract, and so little mortar was used that many of the joints do not appear to have been filled. In driving rainstorms they receive large quantities of water which keep the walls very damp and almost incessantly exude moisture into the dwelling. The dampness of the dwelling is further increased by the character of the site, which is underlaid by a sloping ledge over which the water flows, saturating the soil surrounding the dwelling and keeping its cellar wet. From these causes the dwelling is unhealthy, and it is unsuitable for occupancy in so severe a climate. It is claimed that on this account five deaths have occurred in it since

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its erection in 1853. It would cost, to remedy these radical defects in the walls and of the site, almost, if not quite, as much as it would to erect a new building on a proper site. A new building on a better site, it is estimated, would cost \$3,300, and it is recommended that an appropriation of this amount be made for that purpose.

29, 30. Matinicus Rock, on Matinicus Rock, Atlantic Ocean, off the coast of Maine.—The workroom at the south tower and the tramway from the boathouse to the signal house were rebuilt. Various repairs were made. The following recommendation, which was made in the Board's last annual report, is renewed:

For more than twenty years, and until recently, the first assistant keeper was the son of the principal keeper and the two lived together in one dwelling. The resignation of the principal keeper has broken up this arrangement. At this important station, which has two second-order lights and a steam fog signal, a keeper and three assistant keepers are employed. These are the only people living on this rock. Two of the assistant keepers, with their families, live in one double dwelling and the principal keeper lives in a separate single dwelling. These three sets of quarters are adapted only to the accommodation of three families, and a fourth set of quarters is therefore urgently necessary for the third assistant. It is estimated that a proper dwelling can be built for \$3,200, and recommendation is made that this amount be appropriated for that purpose.

This bare, rocky islet is about half a mile long and of irregular width, nowhere exceeding an eighth of a mile, and the highest part is not more than 50 feet above the sea level. There is a little cove where material can be hauled up in pleasant weather, but it has no harbor. The light-house keeper effects a landing by steering his boat through the breakers on the top of a wave, so that it will land on the boatways, where his assistants stand ready to receive him and draw his boat so far up on the ways that a receding wave can not carry it back to the sea. There is neither tree nor shrub and hardly a blade of grass on the rock. The surface is rough and irregular and resembles in a large way a confused pile of loose stone. Portions of the rock are frequently swept by the waves, which move the huge boulders into new positions. During the storm of January 19, 1856, the sea made a complete breach over the rock, washing away every movable thing. The old dwelling was so thoroughly demolished that not one stone was left upon another. The then new dwelling, though situated in the most protected spot, was flooded, and heavy wooden shutters had to be closed to prevent the violence of the spray from breaking them in. The rock is about 20 miles from the mainland, as the crow flies. Rockland, 25 miles distant, is the nearest harbor, unless the coves of Matinicus Island, 4 miles from the rock, be considered as harbors. They can be entered only with certain winds by vessels of very light draft. The isolation of this station and the difficulty of landing material here of course enhance the cost of erecting the proposed structure, in which strength rather than the graces of architecture are most considered.

— *Two-Bush Island, southeast point, entrance to West Penobscot Bay, seacoast of Maine.*—The very capacious and important waterway, embracing the Penobscot Bay and river, has three entrances from the sea, viz: the East Bay, the Muscle Ridge Channel, and the West Bay, between them. The East Bay is little used of late years. The Muscle Ridge Channel is the shortest and most direct route in or out of the West Bay. It is thoroughly marked by aids to navigation, and is used by most vessels, but it is narrow, and is frequently obstructed in fogs and calms by vessels anchoring in the channelway. Sailing vessels

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anchor throughout its length whenever they are overtaken by fog or calm. During the midsummer season, when the fogs are dense and frequent, the steamers of the Boston and Bangor line, heavily laden with passengers, traverse this passage twice a day, and the steamer of the Maine Steamship Company passes through it four times a week. In thick weather, when these steamers find the channel crowded with vessels at anchor, navigation becomes perilous. The West Bay has a broad and deep mid-channel, which is accessible through a second channel known as the Two-Bush Channel, about 2 miles wide, between Crow Island and Two-Bush Island on the north, and the Northern Triangles on the south. This is the widest and cleanest channel into the West Bay. It is not straight like Muscle Ridge, there being two changes of direction between Monhegan and Munroe Island, the first of about three points, the second of about five points. Two-Bush Island is in this latter or more northern turn. A record of passing vessels, kept at Whitehead Light-Station during four months of last spring, gives the number of vessels in each channel as follows:

Number of vessels passing through these two channels in four months.

	Febru- ary.	March.	April.	May.	Total.
Muscle Ridge	157	1,526	2,488	2,682	6,853
Two-Bush.....	61	555	997	2,318	3,931

This shows that nearly two-thirds as many vessels pass by Two-Bush Channel without light or fog signal, as by Muscle Ridge with both, and seems to indicate the need of opening up this channel to the use of navigators, and of relieving the Muscle Ridge Channel from the engorgement or crowding of vessels which sometimes takes place there. It is proposed to establish a flashing light and fog signal on the southeastern point of Two-Bush Island. The light should have a white sector extending on a line drawn from Hay Ledge through Two-Bush Island eastward and covering all south of that line; a red sector covering the northeast quarter up to Munroe Island; and a dark sector from Munroe Island around westward to Hay Ledge. The light should be about 30 feet high with its focal plane about 60 feet above the sea. It is estimated that a light-station, embracing a brick tower, with illuminating apparatus, a double keeper's dwelling, a boat house and slip, a bell tower with bell and striking machine, barn and outbuildings complete, including the cost of the island and expense of title, would cost not exceeding \$19,000, and it is recommended that an appropriation of this amount be made therefor.

37. *Grindel Point, entrance to Gilkey Harbor, Maine.*—The barn, 16 by 24 feet in plan, was rebuilt. The light-house premises were inclosed

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with a wire fence. A brick floor was laid in the cellar. Various repairs were made.

41. *Marshall Point, entrance to St. George Harbor, Maine.*—A boat-house, 10 by 20 feet in plan, was built.

42. *Monhegan Island, on Monhegan Island, Atlantic Ocean, off the coast of Maine.*—The old stone house was demolished. A frame ell to the dwelling, 17 by 20 feet in plan, was built upon its site. Minor repairs were made to the dwelling. A brick service room was built. It is 10 by 12 feet in plan, and is attached to the tower. Various repairs were made.

45. *Pemaquid Point, entrance to Muscongus Bay, Maine.*—A boundary board fence was built. Various repairs were made.

46. *Ram Island, entrance to Boothbay Harbor, Maine.*—Plank walks were built from the dwelling to the bridge, to the fuel house and to the barn, the latter having one flight of stairs. Minor repairs were made.

47. *Burnt Island, entrance to Boothbay Harbor, Maine.*—Some 30 feet of the lower end of the boatslip were renewed. The boathouse was lengthened 6 feet and was remodeled. A plank walk was built from the dwelling to the fuel house. Various repairs were made.

48. *Cuckolds Island Fog-Signal Station, off Southport Island, coast of Maine.*—Work on the building was begun in January, 1892, at the Board's shop in Portland, and in April, 1892, the work of preparing the site and erecting the buildings was begun at the station. At the close of the fiscal year, the preparation of the site was completed, and the work on the double fuel house, the boathouse and the false work was finished. Four courses of granite were in place and clamped and about 90 yards of concrete were laid. The work was done by hired labor, and most of the materials were taken to the island in the tender *Myrtle*. The station will probably be completed by October 30, 1892.

— *Perkins Island, Squirrel Point, Doubling Point, Ames Ledge light-stations, Kennebec River, Maine.*—There were 3,137 arrivals of vessels in this river during the year, not counting the steamers which ply daily. The steamers *Kennebec*, 1,652 tons, and *Sagadahoc*, 1,413 tons, made ninety-six round trips each from Gardiner to Boston. Other passenger steamers ply on the river from Bath to Augusta, Boothbay and Popham Beach, and intermediate places. The number of passengers carried was 232,150. Seventeen tugs were engaged on the river in towing. Thirty-nine vessels of 32,063 gross tons were built on the river, valued at \$50 per gross ton, or say \$1,603,150. The vessels arriving will average 450 tons. Some 24 feet draft can be carried to Thwings Point, 6 miles above Bath, 16 feet draft from Thwings Point to Gardiner, and 8 feet from Gardiner to Augusta. The Kennebec River is kept open by the towboats during the winter from Bath to the sea. Above Bath the buoys are taken up about November 20, and the river is likely to freeze

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at any time after this date. The ice usually goes out early in April. The river not only has the sea fogs, which extend to Bath, but its own river fog or mist which is dense and at times low down. On dark nights it is sometimes impossible to tell where the water ends and the shore begins. The Light-House Establishment maintains no lights or fog signals in the Kennebec, but the Kennebec Steamboat Company and the towboat companies have united for many years in maintaining lanterns hung on the buoys at turning points or other difficult places. The above facts establish, in the Board's opinion, the necessity for and advisability of increasing the aids to navigation in the Kennebec River, and it recommends the establishment of the following-named lights:

On the southwest point of Perkins Island a fixed red lens-lantern light, with a white sector to the northward and a fog bell struck by machinery, at an estimated cost of \$5,700.

At Squirrel Point a fixed red light from a lens lantern, with a white sector to the southward, at an estimated cost of \$4,650.

At Doubling Point a red lens-lantern light, showing up and down the river, with a fog bell, and one-half mile east from the point, white range lights, not less than 500 feet apart, to mark the channel from Ram Island to Fiddlers Reach, at an estimated cost of \$6,300.

At Ames Ledge, just above Thwings Point, a red lens lantern, mounted on the wooden spindle, which is maintained there during the navigable season, at an estimated cost of \$75.

It is estimated that these four light-stations can be established for not exceeding \$16,725, and it is recommended that an appropriation of this amount be made therefor.

51. *Seguin, on Seguin Island, Maine.*—A brick oil house was built, 11 feet by 16 by 7½ feet in plan. Various repairs were made.

53; 54. *Cape Elizabeth, Maine.*—A new revolving machine, made in the Board's machine shop in Boston, was set up. The old coal bunkers were replaced by new ones. Various repairs were made. The following recommendation, made in the Board's last annual report, is renewed:

Until the resignation of the principal keeper, about two years ago, his wife was an assistant keeper, so that there were but three families to be accommodated in the three single dwellings at the station. This arrangement is changed, and there are now four separate families at the station, and two families are crowded into a dwelling adapted in size and arrangement to only one family. The two towers are more than 900 feet apart; two of the dwellings are near the northeast and one near the southwest tower. A fourth dwelling is very urgently needed near the latter to properly and conveniently house in the severe winter weather of that climate the second of the two assistants who attends the light in it. Besides a first and a second order light, the station has a first-class fog signal, and an additional dwelling is imperatively needed in the best interests of the service. It is estimated that one can be built for \$3,300, and it is recommended that an appropriation of this amount be made therefor.

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— *Spring Point Ledge, Portland Harbor, Maine.*—The following recommendation, made in the Board's last annual report, is renewed:

A bell should be placed on Spring Point Ledge, Portland Harbor, at a point where it would mark that dangerous ledge, which lies in bold water at the edge of the channel. It would also mark a turning point, and would be of great service to vessels making their way into Portland Harbor in thick weather, going either to the wharves, to an anchorage in Diamond Island Roads, or to the westward of Fort Gorges. At present they have to grope their way unaided after leaving the bell buoy off Cushing Island Point. When the sea is exceptionally calm this buoy does not ring, and there is no guide for vessels from the time they pass the trumpet at Portland Head. With a bell on Spring Point Ledge, vessels could always change their course there in thick weather, without depending, as they now do, on their time from the bell buoy or from Portland Head, 2 miles distant. The difficulty is increased by the liability of the reckoning being lost in meeting other vessels which throng the harbor, and some of which even anchor in the channel in the midsummer season, when the fogs are most dense and frequent.

The peril to vessels in thick weather is also somewhat increased by the tendency of a current, issuing at some states of the tide between Cushing (Bangs) Island and Fort Scammel, to set vessels toward the Spring Point side of the channel, and of the ebb current to set them in a southerly direction on to Spring Point Ledge.

Seven steamship companies own steamers which enter Portland Harbor. They embrace the regular coastwise lines, one foreign line, and the steamers plying between Portland and places in the immediate vicinity which are of daily resort in summer. These companies claim that 518,362 passengers were carried into Portland by their steamers last year, as follows:

Casco Bay Company	317, 285
Portland Steam Packet Company.....	75, 482
International Steamship Company.....	40, 325
Maine Steamship Company.....	4, 495
Harpwell Steamboat Company.....	6, 000
Portland and Boothbay Steamboat Company.....	3, 000
Steamer <i>Greenwood</i>	36, 000
Steamer <i>S. E. Spring</i>	35, 000
Allan Steamship Line	775
Total	518, 362

In view of the excellence and importance of the harbor, the very large number of vessels which annually resort to it for refuge, the great number of passengers carried into it, which will doubtless steadily increase with the increasing number of people who resort to the coast of Maine in midsummer, and the frequency and density of the fogs at the very period when the passenger traffic is greatest, it is recommended that provision be made for the establishment upon Spring Point Ledge of a fog bell and a light of the fifth order, in a depth of water not to exceed 12 feet at mean low tide, and the building of a structure of about the type and diameter of those at Crabtree Ledge and Goose Rocks, Maine. It is estimated that this can be done for \$45,000, and it is recommended that an appropriation of this amount be made for that purpose.

56. *Portland Breakwater, Portland, Maine.*—A fuel house, 8 by 12 feet in plan, was built. Various repairs were made.

57. *Wood Island, entrance to Wood Island Harbor, Maine.*—A barn, 18 by 25 feet in plan, and a plank walk 60 feet long inside the boat-slip, were built. Various repairs were made.

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59. *Cape Neddick, on York Knubble, Cape Neddick, Maine.*—New plank walks with steps were laid from the dwelling to the tower. Various repairs were made.

60. *Boon Island, seacoast of Maine.*—The following recommendation, made in the Board's last annual report, is renewed:

There are at this station one keeper and two assistants, and but two sets of quarters in one double dwelling. The second assistant keeper has to board either with the family of the keeper or with that of the first assistant keeper. This forced arrangement is unsatisfactory to all, and is quite unfavorable to the retention of a second assistant of the needed qualifications. The station is isolated and exposed, the tower is tall, and this second-order light is an important one. A third dwelling, which is urgently needed, it is estimated can be built for \$3,400. It is therefore recommended that an appropriation of this amount be made therefor.

61. *Whaleback, outer entrance to Portsmouth Harbor, New Hampshire.*—The rocks that were washed by the seas up on the slip and in front of the ladder at the entrance of the tower, by the storm of January, 1892, were removed. Boatways, 10 by 100 feet in plan, were laid and secured to the ledge. A strap for platform around the fog-signal tower, was made in the Board's machine shop at Boston. Various repairs were made.

62. *Portsmouth Harbor, on Fort Point, inner entrance to Portsmouth Harbor, New Hampshire.*—A fuel house 12 by 18 feet in plan, was built. Various repairs were made.

63. *Isles of Shoals, on White Island off Portsmouth Harbor, New Hampshire.*—Some 130 feet of plank walk were laid from the dwelling to the outbuildings and covered way. A brick oil house was built. It is 10 feet 8 inches by 9 feet 4 inches in plan. A new revolving machine, made in the Board's shops, was set up. Various repairs were made.

REPAIRS.

Repairs, more or less extensive, were made during the year at the following-named stations:

1. St. Croix River, Me.	33. Rockland Breakwater, Me.
4. Little River, Me.	39. Fort Point, Me.
5. Avery Rock, Me.	43. Manana Island Fog-Signal Station, Me.
9. Nash Island, Me.	44. Franklin Island, Me.
16. Crabtree Ledge, Me.	49. Hendricks Head, Me.
17. Baker Island, Me.	52. Halfway Rock, Me.
23. Saddleback Ledge, Me.	55. Portland Head, Me.
24. Heron Neck, Me.	58. Goat Island, Me.
25. Deer Island Thoroughfare, Me.	60. Boon Island, Me.
26. Goose Rocks, Me.	
31. Whitehead, Me.	

SURVEYS.

At the following-named stations the light-house lands were surveyed, their boundaries were marked with stone posts or copper bolts, the

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contours were located by plane-table, and the buildings were measured for ground plans:

10. Narraguagus.

18. Great Duck Island. (Additional contours and locations of buildings only.)

31. Whitehead.

48. Cuckolds Island Fog-Signal Station.

Plots of the light-house land, showing in detail the contours and buildings, with separate plots of the buildings on a larger scale, were made of the following-named stations:

10. Narraguagus.

48. Cuckolds Island Fog-Signal Station.

DAY OR UNLIGHTED BEACONS.

Fiddlers Ledge, entrance to Fox Island Thoroughfare, Maine.—One of the stones washed out by the high seas was replaced and was secured with iron dogs. The beacon itself was repointed and its concrete topping was partly renewed.

The Graves, off Camden, Penobscot Bay, Maine.—An iron spindle 35 feet long, 8 inches in diameter at the butt and 4 inches at the tip, surmounted by an upright cask, was set upon the ledge.

Western Duck Rock, Monhegan Island, Maine.—The tripod carried away in the storm of March, 1892, was replaced.

Fishing Rocks, Kennebunk Port, Maine.—A new iron cage was put on the spindle.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

3. *West Quoddy Head, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,467 hours during the year, and consumed about 66½ tons of coal.

6. *Libby Islands, Maine.*—The third-class Daboll trumpet, in duplicate, at this station, was in operation until August 15, 1891. It had run some 426 hours, and had consumed about 1 ton of coal. The duplicate 10-inch steam whistle at this station was in operation, commencing August 15, 1891, some 1,294 hours, and consumed about 51½ tons of coal.

11. *Petit Manan, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,926 hours, and consumed about 64 tons of coal.

14. *Mount Desert, Maine.*—This third-class Daboll trumpet, in duplicate, was in operation since November 30, 1891, some 675 hours, and consumed about 3½ tons of coal.

18. *Great Duck Island, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,417 hours, and consumed about 64½ tons of coal.

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29, 30. *Matinicus Rock, Maine.*—The signals of this station, a 10-inch and a 12-inch steam whistle, were in operation some 1,455 hours, and consumed about 57½ tons of coal.

31. *Whitehead, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 2,324 hours, and consumed about 69 tons of coal.

43. *Manana Island, Maine.*—This first-class Daboll trumpet, in duplicate, was in operation some 1,122 hours, and consumed about 13½ tons of coal.

51. *Seguin, Maine.*—This 10-inch steam whistle, in duplicate, was in operation some 1,089 hours, and consumed about 47½ tons of coal.

53, 54. *Cape Elizabeth, Maine.*—The signals are a second-class steam siren and a 12-inch steam whistle. They were in operation some 615 hours, and consumed about 31½ tons of coal.

55. *Portland Head, Maine.*—This second-class Daboll trumpet, in duplicate, was in operation some 786 hours, and consumed about 9¾ tons of coal.

61. *Whaleback, New Hampshire.*—This third-class Daboll trumpet, in duplicate, was in operation some 884 hours, and consumed about 4½ tons of coal.

BUOYAGE.

The buoys of the district are in good condition. The buoy on Winslow Rock, Kennebec River, and 2 buoys in Sand Channel, Moosabec Reach, have been discontinued; 1 bell buoy, 1 can buoy, and 13 spar buoys have been established. The spar buoys on Stump Cove Ledge and Hay Island Ledge, in Eggemoggin Reach, were changed to nun buoys. There were 123 buoys replaced, 175 buoys changed, and 569 buoys painted, as stated elsewhere.

DEPOTS.

Little Diamond or Hog Island, Portland Harbor, Maine.—During the past winter the reëntering angle at the southeast corner of the wharf, 50 by 100 feet in plan, was built up and planked with hard pine. There is here ample room for material and labor. The middle portion of the wharf was replanked with spruce.

Whitehead, Maine.—The coal shed, wheeling stage, wharf, and approaches are in good condition, as extensive repairs were made in 1891.

Bear Island, Mount Desert, Maine.—The work of extending the wharf on the north side for a distance of 50 by 100 feet was begun on June 13, 1892, so that at the close of the fiscal year but little progress had been made.

TENDERS.

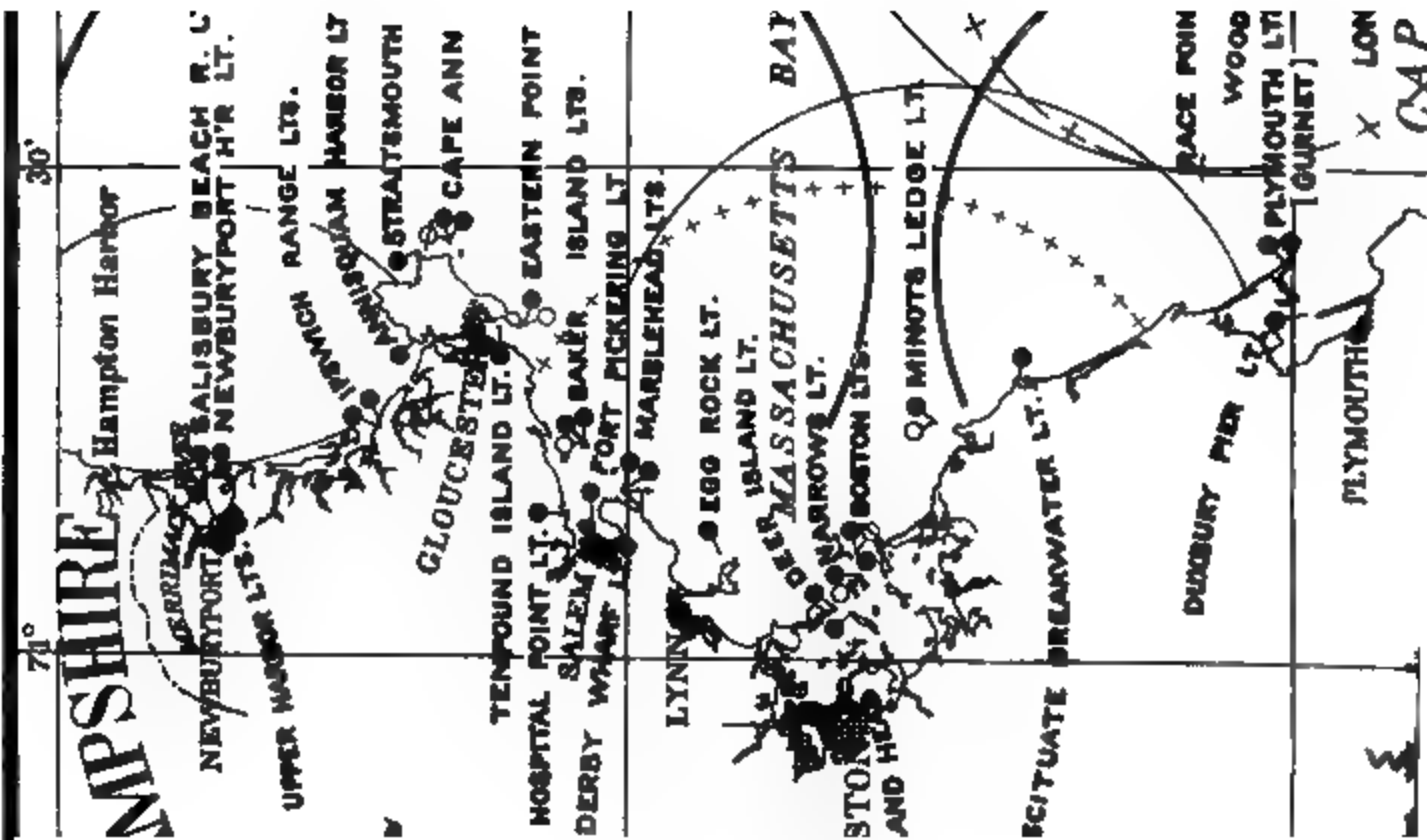
The Iris.—The tender *Iris* was hauled out on the marine railway in April, when her bottom was cleaned and painted, and a few sheets of copper were placed at the water line. Small repairs were made four

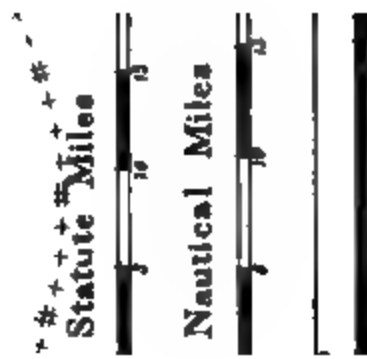
First District.

different times on the boiler. This district is growing so fast that two tenders are needed. After the new tender, the *Lilac*, arrives, the *Iris* might be repaired if found worthy, and then she should be kept on duty as a buoy tender; that is, she should be used to change, replace, paint, and keep in order the 606 buoys and 104 spindles, beacons, and tripods in this light-house district. There is enough of this work to keep her employed every working day in the year. The other portion of the district work, such as the supply and inspection of the light-stations, the transportation of the keepers and families from one station to another, the examination of ground for buoyage, the rapid replacing or repair of buoys which are constantly going adrift, or of bell buoys or whistling buoys which are often out of order, and the making of spar buoys at the depot, could be carried on by the *Lilac*. This would permit the inspector to visit the stations oftener than he can at present. The following is a statement of the way in which the *Iris* was employed during the last fiscal year:

Days laid up for repairs	1
Miles steamed.....	15,380
Tons of coal consumed.....	509
Buoys replaced.....	123
Buoys changed.....	175
Buoys painted.....	569
Spindles painted	1
Buoys made and ironed.....	145
Tons of coal landed at light-stations	521
Days' work at the buoy depot.....	48

Lilac.—This steel screw steamer was built by contract at Cleveland, Ohio, in 1891-'92. She was sent through the Canadian canals and St. Lawrence River and around the Atlantic seacoast to Portland, Me., where she was delivered on August 3, 1892, by the contractors to the inspector of the first light-house district. In coming around she showed herself to be an excellent sea boat. Her length over all is 155 feet; breadth, 26½ feet; depth, 15 feet 2 inches; net tonnage, 212.07. She has a double bottom and false keel. Her engines and boilers are of the best kind. She is doing all that was expected of her, and is enabling the inspector to put the buoyage of the district in good order.





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SECOND DISTRICT.

The second district extends from Hampton Harbor, New Hampshire, to, but does not include, Elisha Ledge, off Warren Point, Rhode Island, and embraces all the aids to navigation on the coast of Massachusetts, except a small portion of Narragansett Bay and Taunton River.

Inspector.—Commander George F. F. Wilde, U. S. Navy.

Engineer.—Maj. William S. Stanton, Corps of Engineers, U. S. Army, to December 14, 1891; Maj. William R. Livermore, Corps of Engineers, U. S. Army, from December 14, 1891.

In this district there are—

Light-houses and beacon lights.....	70
Light-ships in position.....	9
Light-ships for relief.....	2
Day or unlighted beacons.....	72
Fog signals operated by steam or hot-air engines.....	8
Fog signals operated by clockwork.....	10
Lighted buoys in position (gas).....	2
Whistling buoys in position.....	10
Bell buoys in position.....	16
Other buoys in position.....	481
Ice buoys for winter use.....	14
Steamers <i>Verbena</i> , <i>Geranium</i> , and <i>Azalea</i> , buoy tenders and for supply and inspection.....	3
Steamer <i>Myrtle</i> , for construction and repair in the first and second districts.....	1
Whistling buoys, for relief.....	7
Gas buoys, for relief.....	2
Bell buoys, for relief.....	6
Spare buoys to repair losses, nuns and cans.....	87
Spare buoys to repair losses, spars.....	504

LOST OR CONDEMNED DURING THE YEAR.

Nun and can buoys.....	13
Bell buoys.....	2
Spar buoys.....	48

There have been received at Lovells Island Depot from the third district:

Ice buoys.....	8
Whistling buoys.....	3
Bell buoys.....	3
Nun buoy.....	1
Buoy chain, fathoms.....	30
Mushroom anchors, for buoys.....	4

Second District.

There were also received at Woods Holl Depot from the third district:

Whistling buoys.....	3
Bell buoys.....	4
Gas buoy.....	1
Nun buoys.....	2
Tank for holding gas.....	1
Buoy shackles.....	100
Bells for buoys.....	4
Striking balls for bell buoys.....	6
Ballast balls.....	48
Buoy chain, fathoms.....	330

One hundred cedar spars for buoys were purchased for the southern part of the district, and 40 cedar spars for buoys and 50 stone sinkers for the northern part.

LIGHT-HOUSES.

73, 74. *Cape Ann, Thatcher Island, Massachusetts.*—Mr. John Farley, first assistant keeper, was killed on October 20, 1891, while landing at the station in a heavy sea.

81. *Derby Wharf, Salem Harbor, Massachusetts.*—The railing around the lantern, which was broken by a schooner, was repaired. Minor repairs were made.

84. *Egg Rock, off Nahant, Massachusetts.*—A boathouse was built. It is 10 by 20 feet in plan. The boatslip was extended out 34 feet to the boathouse.

85. *Minots Ledge, entrance to Boston Bay, Massachusetts.*—A brick oil house, measuring 9 feet 4 inches by 11 feet, was built. Minor repairs were made to the tower and illuminating apparatus.

86, 87. *Boston, entrance to Boston Harbor, Massachusetts.*—The new revolving machine was put in place. Various repairs were made.

— *Spectacle Island, Boston Harbor, Massachusetts.*—Boston is one of the most important commercial cities in the country. Its harbor is without sufficient aids to navigation. Among those most needed are range beacons on Spectacle Island to mark the center of the dredged channel from State Ledge toward the city and to mark the turning point into the channel for vessels coming up from Nix Mate. The front beacon should be on a pyramidal wooden tower 13 feet high, the base being 8 feet above mean high water. The rear range should be on a similar tower 16 feet high, its base being about 35 feet above mean high water. The station would need a dwelling for the light-keeper, a fuel house, a boathouse, and a boatslip, with an acre of land for a light-house site and a right of way from it to the nearest road. It is estimated that the range lights can be established for not exceeding \$9,350, and it is recommended that an appropriation of this amount be made therefor.

Second District.

— *South Boston Ranges, Massachusetts.*—Ranges should be established on the Marine Park Pier and at City Point, South Boston, to guide vessels coming up Boston Harbor from Nix Mate to State Ledge turn. The range at South Boston City Park should be a mast 50 feet high, with crosstrees 10 feet long, supporting a red lantern at each end. The range beacon at the Marine Park Pier should be a mast reaching about 30 feet above the driveway, supporting two red lanterns, one 6 feet above the other. It is estimated that the range lights can be established for not exceeding \$1,000, and it is recommended that an appropriation of this amount be made therefor.

— *State Ledge, Boston Harbor, Massachusetts.*—The following recommendation, which was made in the Board's last four annual reports, is renewed:

The ship channel, from the Boston wharves to Nix Mate Buoy, has no aids to navigation except buoys. Vessels find it very difficult in thick weather and at night to keep in the channel, and they are particularly perplexed to know just where to turn in the neighborhood of State Ledge and Buoy No. 8, both in leaving and entering the harbor. Large excursion steamers, as well as steamers of the regular lines running out of Boston, frequently have to anchor in thick weather solely because they have no guide between Nix Mate Buoy and the wharves. This greatly incommodes business men going and coming during the summer months when fogs are prevalent. The Board has recognized for a long time the necessity for a light and fog signal at this point, but has postponed action while the improvements in the channel of the harbor in charge of the United States Engineers were in progress. Although these improvements have not yet been entirely finished they are practically concluded in that vicinity, and the Board is of opinion that the time has arrived when a light and fog signal ought to be established near Buoy No. 8, or at or near State Ledge. It is estimated that it will cost \$42,000 to establish a light and fog signal at this point.

It is recommended that an appropriation of this amount be made therefor.

90. *Long Island Head, on Long Island, Massachusetts.*—A brick oil house measuring 11 feet by 9 feet 4 inches was built. Minor repairs were made to the illuminating apparatus.

102, 103, and 104. *Nauset Beach, east side of Cape Cod, Massachusetts.*—Three wooden movable towers were erected by hired labor, 30 feet to the westward of the old towers. This was done because of the washing away of the bank. The lights were moved to the new towers on April 25, 1892. The eastern end of the dwelling was entirely renewed. A sink drain 70 feet long was laid. Some 76 feet of close board fence were built. A brick oil house measuring 11 feet by 9 feet 4 inches was built. Various minor repairs were made.

108. *Monomoy Point, southern extremity of Cape Cod, Massachusetts.*—Six iron trusses were provided and attached to the tower to prevent vibration. Various repairs were made.

Second District.

113. *Sankaty Head, southeastern extremity of Nantucket Island, Massachusetts.*—A brick oil house measuring 8 feet 6 inches by 8 feet 6 inches was built. Various repairs were made.

127. *Edgartown, Edgartown Harbor, Massachusetts.*—A fuel and store house 28 by 9 feet in plan was built. A close board fence 182 feet long was built around the pier to replace the old one. Some 500 feet of surface planking on the bridge were renewed. Minor repairs were made.

129. *West Chop, entrance to Vineyard Haven Harbor, Massachusetts.*—The old tower of rubble masonry, built in 1846, was demolished and a new tower of brick, 45 feet high, was built on the old foundation.

130. *Nobska Point, entrance to Woods Holl Harbor, Massachusetts.*—A stone wall 5 feet thick, 5 feet high, and 100 feet long was built to protect the site of the bell tower. Repairs were made to the striking machine.

131. *Cuttyhunk, on Cuttyhunk Island, Massachusetts.*—The old dwelling of rubble masonry, built in 1823, was demolished and a frame dwelling, 20 by 19 feet in plan, with ells, each measuring 16 by 12 feet, was rebuilt on its foundation. A temporary wooden tower was erected. The dwelling and tower were connected by a covered way.

—. *Butler Flat, New Bedford Harbor, Buzzards Bay, Massachusetts.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

The entrance near buoy No. 9, on the point of Butler Flat is narrow, obscure, and difficult to find in snowstorms, fogs, and dark nights. If a light with a fog signal was placed on that point it would mark both the entrance and turning point; would guide vessels to an anchorage in the lower harbor, and, with the light on Palmer Island, would guide them clear of North Ledge, Henrietta and Hurricane Rocks, in Buzzards Bay, and be of great service to the navigation of this important port. It is stated by the custom-house authorities that 1,814 vessels entered the port of New Bedford during 1887, not including yachts, fishing craft, or boats. It is also stated that the Vineyard Sound and Nantucket steamers took 75,000 passengers to and from this port and received \$22,500 for freight carried. It is further stated that the New York propellers made 104 trips between New York and New Bedford, and received over \$100,000 for freight carried. New Bedford is now said to be the third manufacturing city in Massachusetts, and the collector of the port states that about 500,000 tons of shipping came into the port during last year.

The Board, as stated in its last annual report, is of the opinion that the needs of commerce and navigation require the establishment of a light and fog signal at this point. It is estimated that they can be erected for \$45,000, and it is recommended that an appropriation of this amount be made therefor.

136. *Clark Point, New Bedford Harbor, Massachusetts.*—The barn was rebuilt. Some 72 feet of sink drain were laid. A scuttle was put in the roof of the dwelling. Various repairs were made.

140. *Ned Point, east side of Mattapoissett Harbor, Massachusetts.*—A covered way from the dwelling to the tower, and a fence were built. Minor repairs were made.

Second District.**REPAIRS.**

At each of the following-named stations repairs of a greater or less extent were made during the year:

64, 65. Salisbury Beach, Mass.
 69, 70. Ipswich, Mass.
 71. Annisquam Harbor, Mass.
 72. Straitsmouth, Mass.
 78, 74. Cape Ann, Mass.
 75. Eastern Point, Mass.
 76. Tenpound Island, Mass.
 82, 83. Marblehead, Mass.
 88. Narrows, Mass.
 89. Deer Island, Mass.
 91. Scituate Breakwater, Mass.
 94. Duxbury Pier, Mass.
 95. Race Point, Mass.

96. Wood End, Mass.
 97. Long Point, Mass.
 98. Mayo Beach, Mass.
 99. Billingsgate Island, Mass.
 101. Cape Cod, Mass.
 112. Nantucket (Great Point), Mass.
 115. Gay Head, Mass.
 119. Stage Harbor, Mass.
 120. Bass River, Mass.
 122, 123. Hyannis, Mass.
 126. Cape Poge, Mass.
 128. East Chop, Mass.
 141. Bird Island, Mass.

SURVEYS.

The light-house lands were surveyed. Their boundaries were marked with stone posts or copper bolts. Contours were located by plane table, and the buildings at Baker Island Station were measured for ground plans.

LIGHT-SHIPS.

— *Boston Light-Vessel, entrance to Boston Harbor, Massachusetts.*—A vessel moored about 6 nautical miles E. by S. of Boston Light, showing two red lights, would be of great value to incoming vessels. The well-known difficulty in determining the location of the Boston Light, when approaching in thick weather, and the doubtful utility of the bell at Minots Ledge are strong reasons why this aid to navigation should be established. It is estimated that a first-class light-ship with steam fog signal and auxiliary steam moving power would cost \$70,000 and it is recommended that an appropriation of that amount be made therefor.

107. Pollock Rip Light-Vessel, No. 42, off Chatham, Cape Cod, Massachusetts.—This vessel is in fairly good condition. During a severe gale she broke adrift on October 14, 1891, but she came to anchor on the next day. She was then taken to Hyannis by the tender *Verbena*, and replaced on her station on October 16, the day after. She was uninjured but lost 60 fathoms of chain. On March 1, 1892, she again parted her chain, during a gale with thick snow, and after striking the shoals several times she got clear and came to anchor on the next day about 5 miles southwest of Great Point Light. She was replaced on her station March 6, at single anchor. The ship's moorings were recovered after much time spent in dragging and, on April 10, the vessel was remoored. New riding stoppers, similar to those on Great Round

Second District.

Shoal Light-Ship, will be put in. Engineer's supplies, rubber hose, boat sails, and galley furniture were provided. The fog signal was in use 1,146 hours during the year. There were 118,100 pounds of coal used while the ship's fog signal was in actual operation, and 74,695 pounds of coal were used in keeping fires banked to keep the signal in condition for sudden use; making in all 192,795 pounds of coal used by the fog signal of this ship during the year.

109. *Shovelful Shoal Light-Vessel, No. 3, off Monomoy Point, Cape Cod, Massachusetts.*—Her condition as to repair is good. The copper around the water line is very thin. In August she was run into by an unknown schooner and slight damage was done to her bows and sides. A new bell was substituted for the old one, which was brought in for repairs. She was supplied with galley furniture, rope for riding stopper, her medicine chest was replenished, and her boat was repaired.

110. *Handkerchief Light-Vessel, No. 4, Nantucket Sound, Massachusetts.*—A new galley stove and tinware were supplied. The medicine chest was replenished.

111. *Great Round Shoal Light-Vessel, No. 47, off Nantucket, Massachusetts.*—On July 28, 1891, this new vessel was permanently established on this station, taking the place of Relief Light-Ship, No. 9. The ship has proved to be a success. Her spiral-spring riding stopper works well, preventing any under or sudden jerk on the chain. Her decks were calked during the year. The signal was in use 856 hours. She used 129,781 pounds of coal while the signal was in operation; 77,995 pounds of coal were used in banking the fires; making 207,776 pounds of coal consumed during the eleven months of the fiscal year this ship was on her station.

111. *Nantucket New South Shoal Light-Vessel, No. 1, off Nantucket, Massachusetts.*—On January 6, during a severe gale, the ship parted her moorings. Sail was made, but on account of the gale continuing she drifted about and did not come to anchor until the 15th, Gay Head Light bearing E. by S., distant about 6 miles. The *Azalea* put her on her station on January 18. The mushroom anchor and 105 fathoms of chain were lost. On March 11 she again went adrift, and did not come to anchor until the morning of March 25 near No Mans Land. She was again put on her station by the tender *Azalea* on March 26. The mushroom anchor and 90 fathoms of chain were lost. On June 14 the ship was brought to New Bedford to receive her fog-signal machinery, when Relief Light-Ship, No. 9 was placed on this station.*

124. *Cross Rip Light-Vessel, No. 5, Nantucket Sound, Massachusetts.*—No repairs were made to the hull or rigging during the year. She was

*An appropriation of \$70,000 was made in the sundry civil appropriation act approved on August 5, 1892, for building a light-ship to be stationed on New South Shoal off Nantucket. The Board has taken the proper measures to have the light-ship built as soon as practicable.

Second District.

supplied with galley furniture and boat anchor. The color of the light was changed on February 29, 1892, from white to red.

125. *Succonnessett Shoal Light-Vessel, No. 6, Nantucket Sound, Massachusetts.*—Her decks were calked during the year. She is in fairly good condition.

132. *Vineyard Sound (Sow and Pigs) Light-Vessel, No. 41, western entrance to Vineyard Sound, Massachusetts.*—On August 12, 1891, the lights shown were changed from fixed white to fixed red. New riding stoppers, similar to those on Great Round Shoal Light-Ship, were provided. Her large boat was repaired. She was furnished with engineers' supplies, wire rope, galley furniture, etc., during the year. The fog signal was in use 1,134 hours. There were used, while the fog signal was in operation, about 124,196 pounds of coal; in banking fires some 83,150 pounds; making in all some 207,346 pounds of coal consumed on this ship during the last fiscal year.

133. *Hen and Chickens Light-Vessel, No. 2, entrance to Buzzards Bay, Massachusetts.*—She has remained on her station all the year. The medicine chest was replenished, the large boat was repaired, and blankets, tinware, and galley stovepipe were furnished.

— *Relief Light-Vessel, No. 9.*—She was placed on Nantucket New South Shoal station on June 14, after a new set of wire-rope standing rigging had been fitted. During the year the bell was repaired, and the medicine chest replenished.

— *Relief Light-Vessel, No. 39.*—In July, 1891, she was taken to New Bedford for repairs to her boiler and fog-signal machinery. Her decks were calked, and her apron and decks were repaired. Her bedding was renovated and suction and leading hose, deck pump, galley furniture and crockery were furnished. The medicine chest was replenished.

DAY OR UNLIGHTED BEACONS.

Scituate Harbor, Massachusetts.—The south beacon, which was blown down by the gale of October 6, 1891, was replaced by a new spar with day mark.

Colliers Ledge, off Hyannis, Massachusetts.—Some 200 cubic feet of the concrete filling and the day mark were renewed and two iron bands were put around the beacon.

Seal Rocks, Hingham Bay, near Hull, Massachusetts.—Two dolphins were erected. Each consists of five piles, united at the top and surmounted by a spindle supporting a cask 20 feet above high water.

Spindle Rock Spindle, entrance to Edgartown Harbor, Massachusetts.—This spindle, which was badly damaged by ice, was repaired.

Mattapoissett Harbor, Massachusetts.—In July a spindle was erected on Angelica Rock, at the entrance to this harbor.

Second District.**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

73, 74. *Cape Ann, Massachusetts*.—This 10-inch steam whistle was in operation 511 hours and consumed about 25 tons of coal.

86. *Boston, Massachusetts*.—This first-class steam siren was in operation 757 hours, consuming about 52 tons of coal.

95. *Race Point, Massachusetts*.—The 12-inch steam whistle was in operation 627 hours and consumed about 28 tons of coal.

101. *Cape Cod, Massachusetts*.—This first-class Daboll trumpet was in operation 522 hours, consuming about 6 tons of coal.

107. *Pollock Rip Light-Vessel, No. 42, Massachusetts*.—This 12-inch steam whistle was in operation 1,146 hours and consumed about 86 tons of coal.

111. *Great Round Shoal Light-Vessel, No. 47, Massachusetts*.—This 12-inch steam chime whistle was in operation 856 hours and consumed about 93 tons of coal.

129. *West Chop, Massachusetts*.—This 10-inch steam whistle was in operation 485 hours and consumed about 24 tons of coal.

132. *Vineyard Sound Light-Vessel, No. 41, Massachusetts*.—The 12-inch steam whistle was in operation 1,134 hours and consumed about 93 tons of coal.

BUOYAGE.

July 29 the whistling buoy off the Graves, Boston Harbor, was moved three-eighths of a mile N. $\frac{1}{2}$ E. of the old position. On August 5 seven spar buoys were established in Robinson Hole, between Vineyard Sound and Buzzards Bay. On August 18 a second-class black can was placed alongside the bell buoy at Nix Mate, Boston Harbor. Spindles having been erected on Inner and Outer Seal Rocks, Hingham Bay, the spars marking these rocks were removed. On August 21 a buoy was placed alongside of a schooner which had been sunk in Hyannis Harbor. In September a buoy was placed alongside the schooner *Andrew J. York*, which had been sunk near Cross Rip light-ship. A buoy was placed on the wreck of the schooner *Python*, sunk in Pollock Rip Slue. On September 17 a bell buoy was established off Pig Rock, near Marblehead. On October 26 a buoy was placed over the wreck of the schooner *Florence Nowell*, sunk near Pollock Rip light-ship. On November 4 a buoy was placed over the wreck of the schooner *Mary A. Oliver*, sunk at entrance to Vineyard Haven Harbor. On November 2 a red spar buoy was established at the entrance to Mattapoisett Harbor, and a black can buoy was moored on the east end of Norton Shoal, Vineyard Sound. In February a buoy was placed over the wreck of the schooner sunk near Cross Rip light-ship. On February 14 a whistling buoy was established off Chatham Bar. In March a severe gale caused great injury to buoys along the coast. Two nun

Second District.

buoys in the northern part of the district and the bell buoys in Pollock Rip Slue and off Orion Shoal were lost. In the latter part of March the bell buoy in Pollock Rip Slue was nearly sunk by a passing vessel. The whistling buoy off Eastern Point, after having been run into, was recovered in a sinking condition. In April a bell buoy was established to mark the entrance into Quicks Hole from Vineyard Sound. On May 6 a bell buoy was established to mark Avery Ledge, at the entrance to Rockport Harbor.

DEPOTS.

Lovells Island, Boston Harbor, Massachusetts.—The wharf was entirely relaid with planking and several new piles were driven. A wheeling stage 100 feet long by 7 feet wide and a platform measuring 80 by 30 feet were built. The platform was built of materials from the old wharf. Some twenty new posts were put in the coal shed and one side of its roof was reshingled. The keeper's house needs new underpinning and a cistern should be built, as the keeper is in need of water.

Woods Holl Little Harbor, Massachusetts.—It is in an excellent condition, with the exception of one coal shed, which needs repairs. A new fence to inclose the yard is needed. A small addition was built, at a cost of \$300, to the house at the depot.

Machine and lamp shop, Boston.—One 32-inch back-gear self-feeding drill press, 1 four-jawed combination chuck, 1 box-body chuck, and 1 pair of planer centers were provided.

TENDERS.

The Geranium.—This steamer was constantly employed during the year. In July slight repairs were made to the middle furnace. In September repairs were again made to her furnaces. In April the local inspector of steam boilers made an examination of her boiler and reported that "it was so nearly worn out that the expense to put it in condition to be depended upon for use would not be good economy." Contracts, therefore, were made for making and putting in a new boiler. She had a new derrick boom put in and galley furniture, table linen, etc., were supplied.

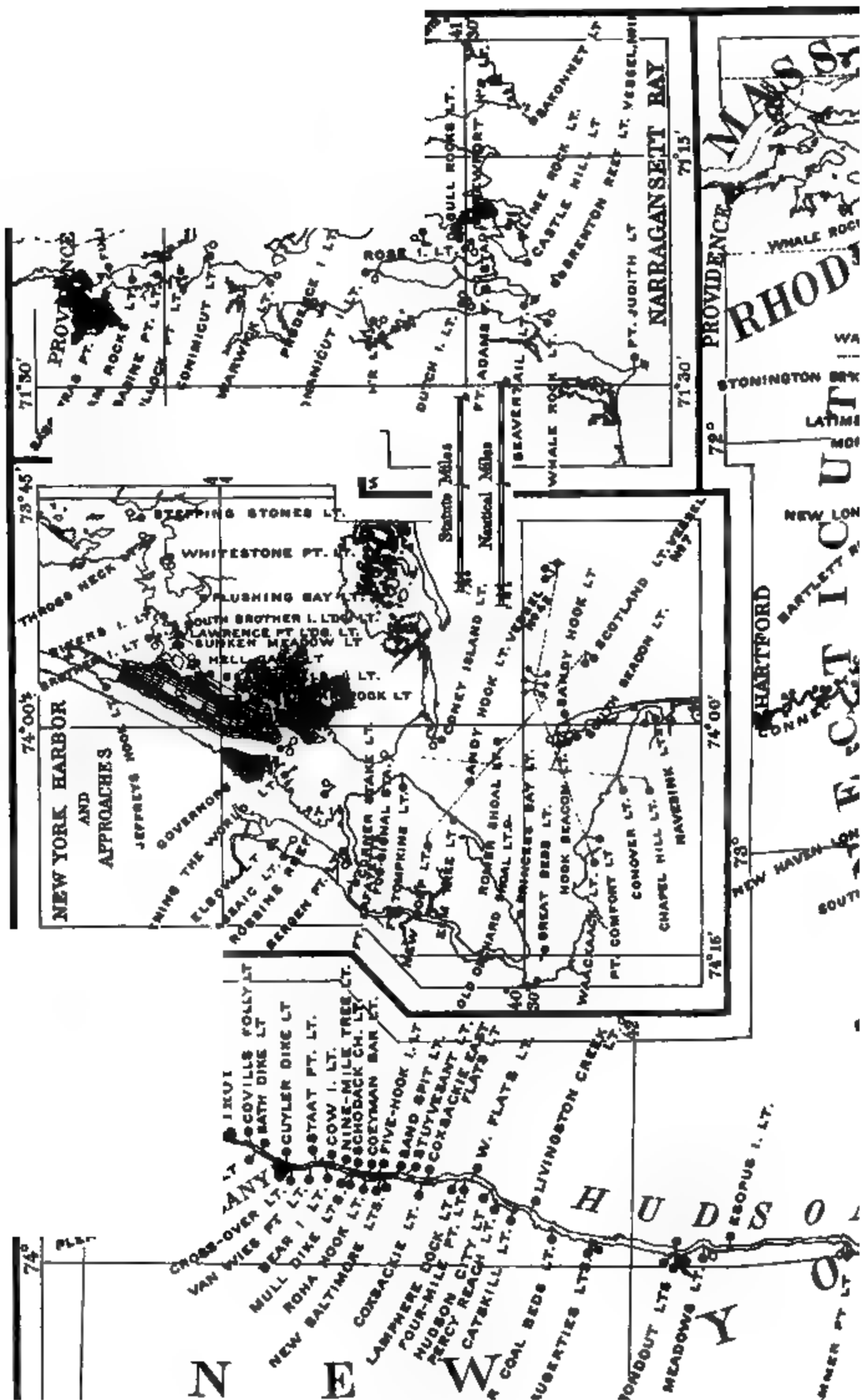
The Verbena.—This steamer was lying at Woods Holl Depot during December, 1891, January, February, March, and April, 1892. During the remaining months of the fiscal year she was constantly employed. In November, 1891, a new smokestack was supplied and repairs were made to her main and hoisting engines. She is now in fairly good condition, and while she is an excellent vessel for buoy work, she is not suited to handle light-ships.

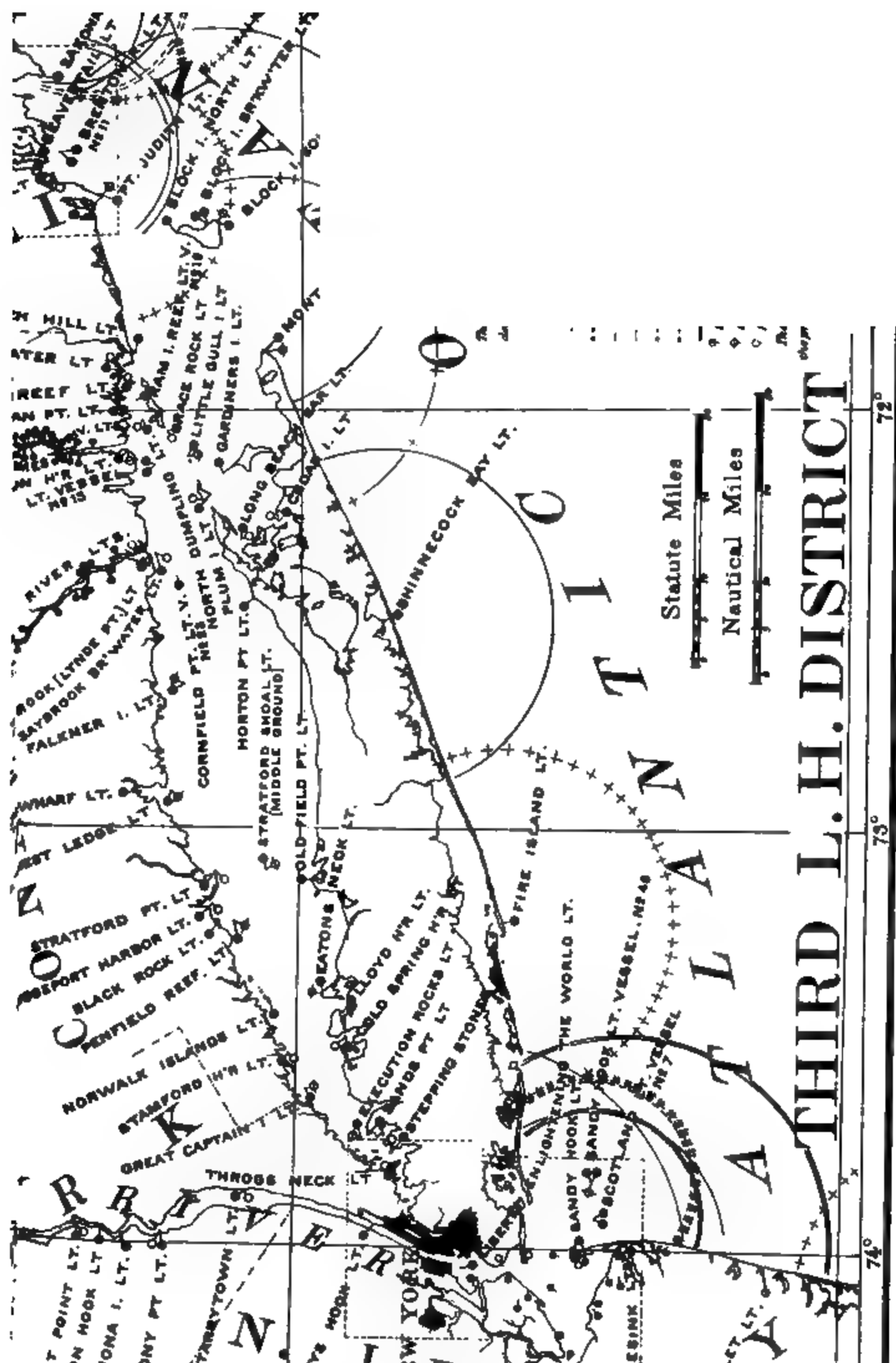
The Azalea.—This steamer in July, 1891, was engaged in placing large marking buoys on the Nantucket New South Shoals, for the use of

Second District.

the Coast Survey. and after that on the regular work of the district. A Stratton separator, steam steerer, and water tanks were put in. She was also supplied with an ice chest, hand grenades, boat cushions, pistons, bedding, glassware, hose, and saloon furniture. Her saloon was remodeled, and in June she was hauled out on the ways and her bottom was scraped and painted. During the year she steamed about 5,853 miles, and used in so doing some 404 tons of coal.

The Myrtle.—This steamer, used for construction and repair, was employed during the year in carrying building materials to the stations in the first and second light-house districts, and landed, at Cuckolds Island, most of the material used in the construction of the fog-signal station. During the year she steamed some 12,800 miles and consumed about 656 tons of coal. In March extensive repairs were made to the boiler, the machinery was thoroughly overhauled, and the steamer is now in good condition.





THIRD DISTRICT.

The third district includes and extends from Elisha Ledge, off Warren Point, Rhode Island, to a point on the coast of New Jersey, opposite Shrewsbury Rocks, and embraces all aids to navigation on the sea and sound coast of Rhode Island, Connecticut, and New York, and of New Jersey above the Highlands of Navesink; Mount Hope, Narragansett, and New York bays; Providence, Connecticut, Thames, Raritan, and Hudson rivers; Whitehall Narrows, and lakes Champlain and Memphremagog.

Inspector.—Capt. Henry F. Pickens, U. S. Navy, to March 3, 1892; Capt. Winfield S. Schley, U. S. Navy, from March 3, 1892.

Engineer.—Maj. David P. Heap, Corps of Engineers, U. S. Army.

There are in this district—

Light-houses and beacon lights, including 82 post lights	225
Light-ships in position	7
Light-ships for relief	2
Day or unlighted beacons	39
Fog signals operated by steam or hot-air engines	15
Fog signals operated by clockwork	49
Electric buoys	7
Whistling buoys in position	5
Bell buoys in position	18
Other buoys in position	560
Steamer <i>Armeria</i> , used for supplying the light-stations of the Atlantic and Gulf coasts	1
Steamers <i>John Rodgers</i> and <i>Cactus</i> , buoy tenders and for supply, inspection of light-stations, and for repair of the cables, etc., of the electric-lighted buoys ..	2
Steamer <i>Gardenia</i> , buoy tender and for freight	1
Steam launch <i>Bouquet</i> , for attending to the electric-lighted buoys	1
Steamers <i>Mistletoe</i> and <i>Rose</i> , used for works of construction and repair of light-stations, fog signals, and day beacons	2
Steamer <i>Nettle</i> , for works of construction and repair on Lake Champlain	1

LIGHT HOUSES.

113. *Sakonnet, mouth of Sakonnet River, Rhode Island.*—The regulating fan of the flash apparatus was repaired and fourteen steps, seven on the east and seven on the west side, were cut into the face of the rock to make safe boat landings.

146. *Castle Hill, Narragansett Bay, Rhode Island.*—A stanchion was fitted under the lantern deck. The fog bell was discontinued November 30, 1891, and the bell and apparatus were removed. Various repairs were made.

— *Plum Beach, Narragansett Bay, Rhode Island.*—The great Sound steamers plying between Providence, R. I., and New York, N. Y., find navigation during fog quite hazardous. In avoiding Dutch Island

Third District.

there is extreme danger of grounding on Plum Beach, as is shown by the recent grounding of the steamer *Pequot*. It is estimated that a proper light and fog signal can be established on Plum Beach for not exceeding \$60,000, and it is recommended that an appropriation of this amount be made therefor.

154. *Gould Island, Narragansett Bay, Rhode Island.*—Boat davits were set up on the wharf. Various minor repairs were made.

161. *Warwick, Narragansett Bay, Rhode Island.*—The old dwelling was moved, set on a new foundation, and remodeled into a barn. Various minor repairs were made.

The following recommendation which was made in the Board's last two annual reports is renewed.

A steam fog signal in duplicate is needed here. It can be established at an estimated cost of \$5,000. It is recommended that an appropriation of this amount be made therefor.

164. *Bullock Point, Providence River, Rhode Island.*—New boat davits were made and set up on the west side of the pier, and landing steps were made and fitted on the east side. Various repairs were made.

— *Black Ledge, New London Harbor, Long Island Sound, Connecticut.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

The necessity for establishing a light and an efficient steam fog signal in such a position as to enable vessels to enter and leave the harbor of New London, Conn., has become evident, and especially so for the aid of those approaching from seaward.

The numerous outlying shoals and ledges surrounding the entrance to this harbor make the approach to it dangerous in thick weather. The location of the present New London light and fog-signal station is so far inside the obstructions as to be partially ineffective as an aid for the purpose of safe navigation of this entrance. The commerce of the port of New London has so increased since the erection of the present light as to change the conditions materially. In consequence of the recent grounding of the steamer *City of Worcester*, on Bartlett Reef, complaint was made that the fog bell of Bartlett Reef light-ship was not adequate to the needs of vessels approaching New London from the westward in a fog, and it was stated that Congress would be petitioned to replace the present light-ship with another carrying a steam fog signal. In view of these facts and the further fact that a naval station is in operation on the Thames River, which empties into New London Harbor, it is suggested that a light and a steam fog-signal station be established on the southwest ledge on the eastern side of the entrance to New London Harbor. Estimate is made that it can be done for \$45,000. It is therefore recommended that an appropriation of that amount be made therefor.

182. *New London Harbor, Long Island Sound, Connecticut.*—A landing wharf was built. Various repairs were made.

— *Thames River Post Lights, Connecticut.*—Lights had been maintained at the expense of the New York and Norwich Steamboat Line, at points on the Thames River, and as these lights were also of use to other transportation companies, the Board was authorized by the act approved March 3, 1891, to light this river between New London and Norwich, from the general appropriation for lighting rivers.

Third District.

On the night of March 29, 1892, lights were established at the following points:

Bailey Point, east shore.

Scotch Caps, west shore.

Cow Point, east shore.

In the water 100 yards north of black buoy, west side of the lower end of Cross Over channel.

Bartlett Point, west shore.

Comstock Wharf, west shore.

Allyn Point, east shore.

In the water at lower end of Long Reach, near red buoy, east side of channel, when the buoy was discontinued.

In the water at upper end of Long Reach near black buoy, west side of channel, when the buoy was discontinued.

Stoddards Old Dock, east shore, north of cove.

Waldens Island, south end, east side of channel.

Mohegan Dike, spindle on dike, east side of channel.

Indian Hill, west shore.

Pride Pier, spindle east side.

Burnt House Pier, spindle on rock, east side of channel.

Perche Rock, west shore.

Sand Pier, near black buoy, west side of channel.

Lower Coal Dock, east shore.

All lights on the east side of the channel are exhibited from red posts, and those on the west side are exhibited from black posts with white tops. By this arrangement they can be readily picked up by day as well as by night. Each post light is numbered and distinguished by its number in large white figures.

The expense of maintaining and caring for these lights is considerably more than for similar lights on the Western rivers, and the Board was unable to find keepers for the lights, at the pay offered, for some time after the lights should have been lighted. As additional lights will probably be needed on this river in the near future and in view of the above facts the Board recommends that the general appropriation for lighting rivers be increased at least \$2,500 to defray the expense entailed by lighting the Thames River.

208. Saybrook Breakwater, Long Island Sound, Connecticut.—Some 700 tons of large riprap stone were placed for the protection of the pier. Two dolphins were built to replace the old ones and will be used for boat-landing purposes. Various minor repairs were made.

215. Devils Wharf Post Light, Connecticut River, Connecticut.—The stone of the pier was reset and secured.

236. Falkner Island, Long Island Sound, Connecticut.—The wharf was rebuilt and the oil house was completed.

237. Southwest Ledge, Long Island Sound, Connecticut.—A boat hoisting winch was fitted and set up. An oil house with a capacity of fifty boxes was built outside the landing gallery. Various repairs were made.

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This station was built in 1877 on a caisson in deep water. Two years ago it became necessary to place a hot-air fog signal in it. The space was not enough to give the engine proper draft and without that it has proved inefficient as a fog signal. It is now proposed to replace this inefficient machine with one recently invented, which has been used elsewhere under circumstances so nearly duplicating those at Southwest Ledge that it is believed that it would succeed at that place. It will, however, be necessary to erect it on a separate foundation outside the tower. It is estimated that this can be done for not exceeding \$12,500, and it is hoped that the forthcoming general appropriation for expenses of fog signals will be sufficient to enable the Board to do this and defray the cost therefrom.

— *Sheffield Harbor, Long Island Sound, Connecticut.*—The following recommendation, made in the Board's annual report for the last three years, is repeated:

- A large and increasing commerce now centers here. During the past year nearly 100,000 tons of coal were landed here in addition to more than that quantity of general merchandise. The New England Terminal Railway Company state that they will begin the transportation of freight in cars on the decks of car-floats and transfer steamers, and the quantity of tonnage will then be more than double. After leaving Execution Rocks light there is nothing to run them in thick weather except a buoy. It is claimed that a light placed here will render more safe the navigation at the entrances of the harbors of Sheffield and South Norwalk. It is proposed to build a small structure with a light and fog bell at the 4-foot spot off Norroaton Point, now marked by a red and black buoy. The structure should consist of an iron caisson filled with concrete, surmounted by a wooden tower to carry the light and fog bell. It is estimated that the work can be done for \$10,000. It is recommended that an appropriation of this amount be made therefor.

— *Bridgeport Light-Station, Long Island Sound, Connecticut.*—The Government has recently built a breakwater at the entrance to this harbor, which makes the harbor to a certain extent a harbor of refuge. A small, inexpensive light on the east end of the breakwater would make the harbor available at night, and without a light it is possible that the breakwater may act on very dark nights as a dangerous obstruction. It is estimated that a proper light can be established here for not exceeding \$2,000, and it is recommended that an appropriation of this amount be made therefor.

244. *Penfield Reef, Long Island Sound, Connecticut.*—The stone of the landing pier was relaid. A Daboll trumpet operated by duplicate Rider hot-air engines was set up. Various repairs were made.

247. *Lloyd Harbor, Long Island Sound, New York.*—Contract was made, according to plans and specifications, for taking down a portion of the east breakwater and building a new breakwater for the protection of the foundations of the dwelling and the light-house tower. Various repairs were made.

Third District.

248. *Cold Spring Harbor, Long Island Sound, New York.*—A red sector was fitted in the lantern, covering Buoy No. 17 and Center Island around to Plum Point. The fences were repaired.

251. *Execution Rocks, Long Island Sound, New York.*—The Ericsson hot-air engine and Daboll trumpet were replaced by a boiler operating automatic steam sirens, and a fog-signal building was erected. The boilers were covered, a coal landing and coal bin were built, a new cistern was built in the basement of the tower with which the boilers are connected, and a concrete walk was built from the entrance of the dwelling to the fog-signal house. The riprap protection was completed, and the characteristic of the light was changed from fixed white to flashing at intervals of 10 seconds.

252. *Sands Point, Long Island Sound, New York.*—The characteristic of the light was changed from flashing to fixed white.

261. *Sunken Meadow Post Light, on the east side of Sunken Meadow, East River, New York.*—This light is obscured from certain directions in which it should be seen. It is now hung from a spindle which is already inclined. As its foundation is under water, it is proposed to rebuild it with a larger base, on which is to be set a cast-iron pipe, 4 feet in diameter and 10 feet high, filled with concrete. The light is to be shown from the top of this structure. Its additional size will make it much more serviceable as a day mark. It is estimated that the structure can be erected for not exceeding \$800, and it is hoped that the general appropriation for repairs, etc., of light-houses will be sufficient to enable the Board to do this work and to defray the cost from that appropriation.

— *North end of North Brother Island, East River, New York.*—A beacon light in the water near the north end of North Brother Island would be of great use to passing steamers, as it would mark the channel between North Brother Island, South Brother Island, and Barretto Point. If placed here there would be no expense for a site, and no delay in obtaining cession of jurisdiction. It is estimated that it could be established for not exceeding \$800, and it is hoped the general appropriation for lighting rivers may be increased sufficiently to enable the Board to do this and defray the expenses therefrom.

269, 270. *Navesink, New Jersey.*—Oil-house No. 2 was completed and the cellar was divided by bulkheads into compartments.

273. *Hook Beacon, Sandy Hook, New Jersey.*—The assistant keeper's dwelling was remodeled. A bell tower was built on the northwest point of the Hook. A plank walk was laid from the bell tower to the electric-light keeper's dwelling. A new fog-signal house was completed and made ready to receive the boilers and new plant.

278. *Waackaack, New Jersey.*—279. *Old Orchard Shoal, New York.*—An appropriation of \$60,000 was made by the sundry civil appropria-

Second District.

the Coast Survey, and after that on the regular work of the district. A Stratton separator, steam steerer, and water tanks were put in. She was also supplied with an ice chest, hand grenades, boat cushions, pistons, bedding, glassware, hose, and saloon furniture. Her saloon was remodeled, and in June she was hauled out on the ways and her bottom was scraped and painted. During the year she steamed about 5,853 miles, and used in so doing some 404 tons of coal.

The Myrtle.—This steamer, used for construction and repair, was employed during the year in carrying building materials to the stations in the first and second light-house districts, and landed, at Cuckolds Island, most of the material used in the construction of the fog-signal station. During the year she steamed some 12,800 miles and consumed about 656 tons of coal. In March extensive repairs were made to the boiler, the machinery was thoroughly overhauled, and the steamer is now in good condition.

Third District.

340. *Pleasure Island Post Light, Hudson River, New York.*—A post light was established.

341. *Covells Folly Post Light, Hudson River, New York.*—A post light was established.

974. *Gordon Landing Pierhead, Lake Champlain, Vermont.*—The light was moved to the extreme west end of the completed breakwater.

979. *Burlington Breakwater, north extension pierhead, Lake Champlain, Vermont.*—The beacon was overhauled and repaired.

982. *Juniper Island, Lake Champlain, Vermont.*—Plans, specifications, and contracts were made for remodeling and extending the wharf, and building a buoy shed and boathouse combined. Some minor repairs were made on the dwelling.

983. *Watch Point, Lake Champlain, Vermont.*—A light was established on the outer pier of the old wharf and was connected with the shore by a bridge.

988. *Old Maid Place, No 16, New York.*—The crib was rebuilt.

989. *Lower end of Four Channels, No. 15, New York.*—The crib was rebuilt.

995. *Maple Bend, No. 8, New York.*—The crib was rebuilt.

996. *Head of Two Channels, No. 7, New York.*—The crib was rebuilt.

998. *Steam-Mill Point, No. 5, New York.*—The crib was rebuilt.

999. *South of Snody Dock, No. 4, New York.*—The crib was rebuilt.

1000. *Opposite Chapman Dock, No. 3, New York.*—The crib was rebuilt.

1002. *Benjamin Place, No. 1, New York.*—The crib was rebuilt.

At the beginning of the year there were 143 light-houses and 82 beacon lights in this light-house district. Two lights and 20 beacon lights were established during the year. Of this number 101 have received repairs of greater or less extent. Every repair was made which the funds allotted would permit. The entire district is in excellent order.

REPAIRS.

At each of the following-named stations repairs of greater or less extent were made during the year :

145. Beavertail, R. I.
147. Fort Adams, R. I.
150. Newport Harbor, R. I.
151. Rose Island, R. I.
152. Dutch Island, R. I.
155. Conanicut Island, R. I.
159. Muscle Bed Shoals, R. I.
160. Bristol Ferry, R. I.
162. Borden Flats, Mass.
163. Conimicut, R. I.
165. Sabine Point, R. I.
166. Pomham Rocks, R. I.
169. Whale Rock, R. I.

170. Point Judith, R. I.
171. Block Island, north, R. I.
174. Block Island, SE., R. I.
175. Watch Hill, R. I.
176. Montauk Point, N. Y.
180. Morgan Point, Conn.
181. North Dumpling, N. Y.
202. Race Rock, N. Y.
203. Little Gull Island, N. Y.
209. Saybrook (Lynde Point), Conn.
240. Stratford Shoal (Middle Ground), N. Y.
242. Bridgeport Harbor, Conn.

THIRD DISTRICT.

The third district includes and extends from Elisha Ledge, off Warren Point, Rhode Island, to a point on the coast of New Jersey, opposite Shrewsbury Rocks, and embraces all aids to navigation on the sea and sound coast of Rhode Island, Connecticut, and New York, and of New Jersey above the Highlands of Navesink; Mount Hope, Narragansett, and New York bays; Providence, Connecticut, Thames, Raritan, and Hudson rivers; Whitehall Narrows, and lakes Champlain and Memphremagog.

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There are in this district—

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Light-ships for relief	2
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Fog signals operated by clockwork	49
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Steamer <i>Armeria</i> , used for supplying the light-stations of the Atlantic and Gulf coasts	1
Steamers <i>John Rodgers</i> and <i>Cactus</i> , buoy tenders and for supply, inspection of light-stations, and for repair of the cables, etc., of the electric-lighted buoys ..	2
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Steamers <i>Mistletoe</i> and <i>Rose</i> , used for works of construction and repair of light-stations, fog signals, and day beacons	2
Steamer <i>Nettle</i> , for works of construction and repair on Lake Champlain	1

LIGHT HOUSES.

113. *Sakonnet, mouth of Sakonnet River, Rhode Island*.—The regulating fan of the flash apparatus was repaired and fourteen steps, seven on the east and seven on the west side, were cut into the face of the rock to make safe boat landings.

146. *Castle Hill, Narragansett Bay, Rhode Island*.—A stanchion was fitted under the lantern deck. The fog bell was discontinued November 30, 1891, and the bell and apparatus were removed. Various repairs were made.

—. *Plum Beach, Narragansett Bay, Rhode Island*.—The great Sound steamers plying between Providence, R. I., and New York, N. Y., find navigation during fog quite hazardous. In avoiding Dutch Island

Third District.

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|---|---|
| 243. Black Rock, Conn. | 289. Fort Tompkins, N. Y. |
| 246. Eatons Neck, N. Y. | 290. Robbins Reef, N. Y. |
| 250. Great Captain Island, N. Y. | 291. Liberty Enlightening the World, N. Y. |
| 254. Throgs Neck, N. Y. | 292. Governors Island post light, N. Y. |
| 259. South Brother Island Ledge post light, N. Y. | 294. Corner Stake, N. J. |
| 260. Lawrence Point Ledge post light, N. Y. | 298. Tarrytown, N. Y. |
| 264. Man-O'-War Rock post light, N. Y. | 299. Stony Point, N. Y. |
| 265. Shinnecock Bay, N. Y. | 305. Esopus Meadows, N. Y. |
| 266. Fire Island, N. Y. | 311. Saugerties, N. Y. |
| 275. Conover Beacon, N. J. | 316. Hudson City, N. Y. |
| 281. New Dorp Beacon, N. Y. | 967. Windmill Point, Vt. |
| 282. Princess Bay, N. Y. | 968. Rouse Point Pierhead, Vt. |
| 283. Great Beds, N. Y. | 969. Isle la Motte, Vt. |
| 285. Western Jetty (upper end) post light, No. 2, N. J. | 970. Pointe aux Roches, N. Y. |
| 286. South Jetty post light, No. 3, N. J. | 973. Cumberland Head, N. Y. |
| 287. Coney Island, N. Y. | 977. Bluff Point, N. Y. |
| 288. Fort Lafayette Fog-Signal station, N. Y. | 978. Colchester Reef, Vt. |
| | 981. Burlington Breakwater, South Beacon, Vt. |
| | 985. Barber Point, N. Y. |

LIGHT-SHIPS.

144. *Brenton Reef Light-Vessel, No. 11, entrance to Narragansett Bay, Rhode Island.*—This vessel was thoroughly repaired and was returned to her station July 22, 1891. She is in good condition and will probably need no repairs during the present year. On November 23, 1891, the characteristics of the fog signal were changed, causing the bell to ring for about ten seconds between silent intervals of thirty seconds. She received during the year tinware, crockery, cooking utensils, rope, lime, rations, fuel, paint, and ship chandlery.

158. *Hog Island Shoal Light-Vessel, No. 12, Narragansett Bay, Rhode Island.*—This vessel is in a condition of weakness and decay. Out of thirteen holes bored in her hull, six of them developed rotten wood; the stem and stern posts are defective; the planking outside, along the water line aft, is soft; and the catheads are rotten. It would take at least \$12,000 to make the vessel fit for the service of more than a few years, and, in the mean time, she would be little better for this important station than the make shift she now is. In the Board's last annual report the history of this vessel was given from the time she was built in 1846 up to 1885, when she was placed on her present station. The following recommendation, then made, is renewed:

It is now found that she is structurally weak from general decay, induced by her old age, and that she is completely beyond economical repair. While she has been quite useful in her position it has become apparent that she could have been of still greater use to the enormous commerce passing this point if she had had a steam fog-signal. No attempt has been made to fit one to her, as she is too small and too weak to carry the weight and support the strain. The time has now come to replace this

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small, weak, worn-out, old vessel by a new, strong ship of at least double her size and strength, not only to occupy this station but, in its turn, to take its place on the outside exposed stations. It is also proposed that she shall have such steam power as will not only operate a first-class fog signal, but will enable her to get on and off her station with her own steam, and also steam up to its moorings when otherwise she would be blown away from her place, dragging her anchor or parting her chain cables.

It is estimated that such a vessel can be built for \$70,000, and it is recommended that an appropriation of that amount be made for this purpose.

179. Ram Island Reef Light-Vessel, No. 19, Fishers Island Sound, in Long Island Sound, New York.—This vessel was rebuilt at Wilmington, Del., in 1876, and since then has received no important repairs. The rail on the starboard quarter, the strongback of her riding-bitts on the starboard side, and the mainmast and trysail mast are rotten. The starboard hawse-pipe is worn through at the outside flange. The metal sheathing needs patching along the water line, and may need to be renewed on the whole of her bottom. The gig is old and needs repairs on the outside planking and the keel. The vessel will have to be taken off her station and docked for thorough examination before a correct estimate can be made of the repairs which she needs. The placing of the new light-ship, No. 51, on the station at Cornfield Point will make available a larger and better vessel for the station. If light-ship No. 19 could be thoroughly repaired she could be used as a relief ship. Whether it will be economical to do so can only be determined by having her docked and thoroughly examined. She received during the year rations, fuel, paint, ship chandlery, and fixtures for a stove.

201. Bartlett Reef Light-Vessel, No. 13, off New London, Long Island Sound, Connecticut.—This vessel is in good condition, except that part of the sheathing on the deck needs to be recalked and payed with paint. She is kept in excellent order. She received during the year rations, fuel, paint, trysail mast, awning, rope, cooking utensils, and ship chandlery.

234. Cornfield Point Light-Vessel, No. 23, off the mouth of the Connecticut River, Long Island Sound, Connecticut.—There are several decayed spots in the outside planking on the port side of the vessel. When she is next docked a thorough examination of her bottom will be made. She is otherwise in good condition. She received during the year rations, fuel, cooking utensils, medicines, and paint. She is kept in excellent order. The new vessel for this station, No. 51, was built at West Bay City, Mich., and is expected soon to arrive at the general depot, Staten Island, where she will be fitted for service.

267. Sandy Hook Light-Vessel, No. 48, off the entrance to New York Harbor, New York.—This vessel was built at South Boston, Mass. She reached the General Light-House Depot at Staten Island, New York, on May 25, 1891, and her outfit and equipment were completed. On August 1, 1891, she was towed out by the tender and placed on the

Third District.

station off Sandy Hook, relieving the old light-ship, No. 16, which was brought to the depot. The forward bulwark needs some calking on account of shrinkage, but this can be postponed until important repairs become necessary. This light-ship has received, since she was placed on her station, rations, rope, paint, ship chandlery, water, and fuel. She is kept in excellent order, rides easily, and has proved a satisfactory vessel. She is supplied with a steam windlass.

268. Scotland Light-Vessel, No. 7, off Sandy Hook, entrance to New York Bay, New York.—This vessel is in fine condition, and will need no important repairs in the present fiscal year. Such supplies as rations, fuel, rope, ship chandlery, and a new boat were furnished. She is kept in good order.

— *Relief Light-Vessel, No. 20.*—This vessel is at the Light-House Depot, New London, Conn. She served as the relief of Brenton Reef light-ship while the latter was off her station for repairs. She needs to be docked and to have her metal sheathing patched on the rudder and around the bow on both sides. A knee of the lantern-house beam is rotten; the bulwark aft, inside and outside, is rotten in spots, and should be renewed, and the rails and log sills on the port bow and starboard quarters need repairs.

— *Relief Light-Vessel, No. 16.*—This vessel is held at the General Depot, Staten Island, in readiness for duty. She was brought in from the Sandy Hook station on August 1, 1891, and preparations were begun to furnish her with a steam fog signal, and thus fit her for the special service of relieving, on occasions, the new vessel, No. 48, at Sandy Hook, as well as for general light-ship service in the district. A new boiler, engine, and fog signal were put in by contract, and all incidental and necessary repairs were made to render her efficient. Change was made in her illuminating apparatus, so that she will show a fixed red light on the mainmast and a flashing red light on the foremast, the latter operated by a pair of small steam engines. She is in good condition for service.

DAY OR UNLIGHTED BEACONS.

Bridgeport Dolphin, Bridgeport Harbor, Connecticut.—A pile dolphin composed of seven piles, the center pile 10 feet above the others, surmounted by a cask. This beacon was rebuilt.

Sand Spit, Sag Harbor, New York.—An iron cylinder 4 feet in diameter surmounted by a spindle and square cage was built on the site of the old beacon.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

145. Beavertail, Rhode Island.—The 10-inch steam whistle, with Crosby automatic signal, was in operation about 506 hours during the year, and about 38 tons of coal were consumed.

Third District.

170. *Point Judith, Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 636 hours during the year, and consumed about 36 tons of coal.

174. *Block Island (southeasterly), Rhode Island.*—The first-class steam siren, in duplicate, was in operation about 712 hours, consuming about 38 tons of coal.

176. *Montauk Point, New York.*—The first-class Daboll trumpet, worked by caloric engines, in duplicate, was in operation about 521 hours, and about $6\frac{1}{2}$ tons of coal were consumed.

182. *New London Harbor, Connecticut.*—The first-class Daboll trumpet, in duplicate, was in operation about 553 hours, and consumed about $7\frac{1}{2}$ tons of coal.

203. *Little Gull Island, New York.*—This second-class steam siren, in duplicate, was in operation about 434 hours, and consumed about 30 tons of coal.

236. *Falkner Island, Connecticut.*—The 10-inch steam whistle, in duplicate, was in operation about 568 hours, and consumed about $33\frac{1}{2}$ tons of coal.

237. *Southwest Ledge, Connecticut.*—The second-class Daboll trumpet, in duplicate, was in operation about 250 hours, and consumed about 2 tons of coal.

240. *Stratford Shoal (Middle Ground), New York.*—The second-class Daboll trumpet was in operation about 459 hours and consumed about $3\frac{1}{2}$ tons of coal.

244. *Penfield Reef, Connecticut.*—The Daboll trumpet, in duplicate, was in operation $24\frac{1}{4}$ hours and consumed one-seventh ton of coal. This fog signal has been in operation only one month.

246. *Eatons Neck, New York.*—The second-class steam siren, in duplicate, was in operation about 352 hours, and consumed about $25\frac{1}{2}$ tons of coal.

250. *Great Captain Island, New York.*—The 10-inch steam whistle, Crosby automatic, in duplicate, was in operation about 281 hours, and consumed about 19 tons of coal.

251. *Execution Rocks, New York.*—The new automatic siren, in duplicate, was in operation about 278 hours, and consumed about 18 tons of coal.

273. *Hook Beacon, Sandy Hook, New Jersey.*—The first-class steam siren, in duplicate, was in operation about 578 hours, and consumed about 61 tons of coal.

BUOYAGE.

The weather of the past winter was, in general, like that of the previous winter. The flow of ice through the navigable channels was rather continuous in its character, but it was not thick or heavy enough to do much damage to the buoyage of the district. In January, 1892,

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there were several days when the ice ran heavily, but the ordinary buoys were not specially affected. Most of the buoys carried away were promptly recovered by the tenders. The winter changes of buoyage took place as usual, and many important changes were made. The law and the regulations in the case were conformed to by placing nun buoys on the starboard side and can buoys on the port side of channels. On certain important stations iron buoys were substituted for spars, or small buoys were replaced by others of a larger size. Many buoys were moved to more advantageous positions. Several rendered unnecessary by change or other circumstance were discontinued, and the sequence was restored by numbering the buoys anew. Ten ordinary buoys were discontinued during the year, and nineteen new ones were placed. Bell buoys were placed off the northeast end of Block Island Breakwater, Rhode Island; in New Haven Harbor, Connecticut, to mark the western breakwater; in Oyster Bay, Long Island, New York, to mark the entrance, and off the pitch of Sandy Hook, New Jersey, in place of the can buoy previously there. These bell buoys embodying the latest improvements continue to give satisfaction to the mariners whom they serve.

On June 15, 1892, a red spar buoy exhibiting a fixed red incandescent light at its head was moored about 58 feet north northeast of the Southwest Spit Buoy, New York Lower Bay. The electric submarine cable supplying the buoy runs SE. by E. $\frac{3}{4}$ E., to a cove near the northwest end of Sandy Hook. It serves as a valuable extension of the system of electric-lighted buoys in Gedney Channel, and serves as the turning point at Southwest Spit into the main highway leading into the harbor.

ELECTRIC-BUOY STATION, SANDY HOOK, NEW JERSEY.

The electric-lighted buoys in Gedney Channel, New York Lower Bay, were in successful operation during the year and gave satisfaction to all who used the highway which they light. There was no period when all the lights were out at once. Only on four occasions were some of the lights extinguished for any considerable time, namely, in 1891, from July 21 to 29, August 13 to 20, August 22 to 29, and in 1892 from April 22 to 30.

Some defects and leaks occurred in the cables, and there were some breakages of lamps, due to faults of manufacture, collisions, or the violence of the sea. Every damage inflicted was promptly repaired and the insulation was restored by the tenders or by the keepers of the station, with a facility and skill to which they have been carefully trained.

The supervision of the plant and operation of the system, including the laying of new cables, is especially in charge of Lieut.-Commander C. H. West, U. S. Navy, assistant to the inspector. To his expert

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practical knowledge of the science and service of electricity and unremitting attention to every detail, the success secured is largely due. As a special result of his observation of defects developed, and of his efforts to correct them, improvements have been made in the manufacture of spars, lamps, and cables to insure longer and better service, and in the case of the cables, to prevent the serious defect of a tendency to convolutions or kinks.

The report of Lieut.-Commander West is referred to for an exhaustive treatment of the subject at large. In his report, an appendix to this volume, Mr. West gives a complete and technical history of the system and the station for the past year, embracing details of construction, damage sustained, defects exposed, renovations and repairs made, improvements adopted and applied, and the present condition of the electric plant. Accompanying the report are tabular forms in which are given clear and full statistics of the operation and advantage of the electric-lighted buoys. It is therefore only necessary to mention here a few of the general features of the subject, and to give some figures to illustrate the great service rendered by the lighted buoys to vessels passing the bar at night.

The increase per month of vessels bound out from 1888-'89 to 1891-'92 was 162.5 per cent; of vessels bound in, 85 per cent.

During the year a new double-armored, three-conductor cable, 17,000 feet long, was purchased to replace portions cut out for defects. Of this new cable the north main cable which shows red lights received 8,520 feet, the south main cable which shows white lights received 800 feet, 7,680 feet remaining in store for future use.

In connection with the system stated under the general head of buoyage, an electric-lighted buoy was established near the Southwest Spit, and connected by 10,500 feet of a single-conductor cable with the plant at Sandy Hook. In laying it Lieut.-Commander West secured the services of the cable steamer *Western Union*, belonging to the Western Union Telegraph Company. This company, in courteous terms, declined to accept payment for the service, and, on recommendation of the inspector, they received the thanks of the Light-House Board.

DEPOTS.

Staten Island, New York.—This is the general depot of the Light House Establishment. The work done here by the light-house engineer consisted, as usual, of manufacturing and repairing lamps, supplies, fitting illuminating apparatus, making oil cans and boxes for supplying oil to light-stations, manufacturing light-house and light-ship lanterns, receiving material for manufacturing and repair work, repairing light-houses, oil houses, and other structures, repairing buoys and other appendages, and general works of repair in the district. The work done here by the light-house inspector consisted in receiving, storing, and shipping supplies, buoys, and appendages, light-vessel equipments,

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rations, and fuel; testing oils, chimneys, and paints; inspecting and weighing provisions and general stores; loading and unloading the supply steamer and the tenders; cleaning and repairing buoys and appendages; repairing tenders and boats; making sails, awnings, and canvas covering; providing and perfecting means and measures for protection against fire, improving the methods of storing, inspecting, and handling the various supplies, and amending and improving in several important particulars the system of keeping books and accounts and in filing and indexing the correspondence so as to facilitate the business of the depot.

The special work done during the year was in making the final adjustments of the fog-signal machinery on Light-Vessel No. 16, and preparing her in every respect to be the relief ship of Light-Vessel No. 48, on duty at Sandy Hook.

Sea wall and depot basin.—The sea wall forming the north side and portion of the angle on the east face of the basin, also the extension of the stone bulkhead northerly to the sea wall was completed. Some 44 feet of sheet piling was built across the east face of the new north wharf. The entrance to the basin was moved 33 feet south, by building in the north and cutting off from the south wharf. Various other repairs were made on the wharves. A small boat landing was built in the southwest angle of the basin. An iron crane of 3 tons' capacity was set up near the coal shed for handling coal, buoys, and other materials. A contract was made for removing the old north wharf, building the new one and dredging the enlarged basin. Before the work of building the new wharf was completed, it was decided to widen it 14 feet, making it 44 instead of 30 feet as originally designed, for which a contract was made and the work was commenced. During the progress of the dredging it was found that a reef extended across the northwest corner of the basin in a northeast and southwest direction, a portion of which it became necessary to remove to obtain the required depth of 14 feet. Contracts were made, after advertising for bids, for the removal of a portion of the reef. The work was completed and the required depth was secured over the entire basin. The work of completing the widening of the north wharf will now be resumed. The south wharf, it is found, is so much decayed as to be unsafe. It will be necessary to put it in repair while the sea wall is under construction. It is estimated that it will cost not to exceed \$75,000 to do what is needful during the next year in continuing the work of enlarging and improving the basin, extending the sea wall,* and renewing the south wharf. It is therefore recommended that an appropriation of this amount be made therefor.

*An appropriation was made in the sundry civil appropriation act approved on August 5, 1892, for extending this sea wall. A further appropriation of \$75,000 is recommended.

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The following statement and recommendation made in the inspector's report of last year is renewed:

The need for enlarging the facilities of the depot for the reception, handling, and care of supplies, oil, and other stock is more pressing every year, until now it is imperative to provide larger and better accommodations.

The storehouse was built in 1864, when space was required for only 2,600 packages of supplies of all kinds. In 1885 the number of packages stored was 5,600.

In the past year space had to be made by building tiers and overcrowding for 7,800.

These last figures do not include packages containing paints, paint oil, chimneys, etc., which are stored in buildings apart from the main storehouse.

The foregoing suggestion is further emphasized by the number of packages stored in the past year, 1891-'92, which amounted to 8,100, from which it will appear that while the service demands have grown, this depot has remained without addition.

Quotation from last year's report is continued:

The oil house on the dock was built in 1881, and held with safety 25,000 cases of mineral oil. Storage is now required for 60,000 cases. It is strongly urged therefore, to remove the coal sheds from their present site to the southern end of the water front, and then to enlarge the oil house to an ample size and strengthen it for use in every part. The storehouse proper should be enlarged to nearly twice its present size, which would require the removal of its adjuncts to other sites. One of these would require the ground occupied by the small house near the north wharf, now used by the Revenue Marine as a receptacle for condemned stores. In any event the space so occupied is needed for the depot, where every foot is indispensable for the work to be done.

The engine for supplying the fire-hose with water is housed in a small building near the dock. In case of fire this house is liable to be destroyed or to become untenable, when the depot would be left without adequate protection. To be prepared for such an emergency, steps have been taken to procure an Amoskeag portable steam fire engine, and an engine house suitable for its reception and care will be built.

The watch house was removed from the sea wall to a more suitable position adjoining the north wall near the main gate. The carpenter shop also was removed last March from the sea wall to a better site in the yard and was altered and enlarged to afford room for the increasing amount of carpenter work to be done. The storehouses and other buildings were repaired, cement washed and painted.

A system of electric wires and signals was established, bringing within call of the office every department and employé required. The result is a more prompt and intelligent despatch in the transaction of business.

There were frequently fire drills during the year, and the employés are now quite efficient in handling the apparatus and hose, and prompt in taking their stations and doing their work.

The service of the office and the work of the depot were done in the usual satisfactory manner.

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New London, Connecticut.—Asphaltic slag roofing was put on the coal shed and storehouse roofs in place of shingles. The north end of the coal shed, and the sides and gables of the storehouse were covered with corrugated galvanized iron. The fence and gate on the line of the railroad were moved in on a line with the buildings and were painted with fireproof paint. This is the permanent station of the tender *Cactus* the duties of which are chiefly performed in the eastern section of the Light-House District. A stock of oil, lime, anchors, fuel, buoys, and appendages, chain cable, and cleaning materials sufficient for emergencies, is kept at this depot.

Relief light-vessel No. 20 is kept here as relief ship. The storehouse and coal shed, fences and gates were repaired, and the depot is now in good order.

Goat Island, Newport Harbor, Rhode Island.—A supply of coal is kept in the shed here for the stations in the vicinity and for the tenders when they are working in the eastern section of the district. Buoys and appendages and mushroom anchors to meet emergencies are kept on the wharf.

Juniper Island, Lake Champlain, Vermont.—Congress on March 3, 1891, appropriated \$2,500 for establishing a buoy depot here. A contract with plans and specifications was made for remodeling and extending the wharf and building a combined buoy shed and boathouse.

TENDERS.

The Armeria.—This supply steamer made three voyages during the fiscal year. On her first trip she sailed from the Staten Island depot, July 27, 1891, supplied the stations from St. Croix River, Maine, to North Brother Island, New York, and returned on September 21, 1891. Her second voyage was begun December 1, 1891, and ended March 11, 1892, and embraced the delivery of supplies to the stations from Cape Lookout, North Carolina, to Point Isabel, Texas. She commenced her third voyage on May 4, 1892, delivered supplies to the lights between Cape Henry, Virginia, and Robbins Reef, including the Hudson River, New York, and returned to the general depot on June 16, 1892. The deliveries to all the stations served by the *Armeria* embraced 249,200 gallons of mineral oil; 220 tons of paints, oils, and turpentine; 3,735 boxes of chimneys and supplies; 10,355 packages of dry goods and hardware, and 220 tons of chain and miscellaneous stores. She steamed some 14,000 nautical miles, and consumed about 1,104 tons of coal. She was hauled out to have her bottom cleaned and painted in November, 1891, and again in June, 1892. In her sea-going qualities, in her accommodations, and in her facilities for her work, she has proved herself an efficient supply vessel, and has given satisfaction. She conveyed, at different times, members of the Light-House Board and district officers on tours of inspection and other important service, and, whenever re-

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quired, gave assistance in district work. The important services of the supply steamer, were, as usual, well done, and she is always kept in fine order. She is in excellent structural condition, and in the present year her electric plant was well kept and gave good results. It is proposed to furnish her with the plant for a system of mechanical marine telegraph signals. She received during the year an electric plant for lighting the vessel, and a new steam launch. Sundry small repairs, changes and adjustments were made, chiefly by the force at the general depot.

The John Rodgers.—During the year this steamer, with the exception of 28 days when she was laid up for repairs, was kept in constant service. She changed or replaced 221 buoys, painted 203, and repaired 39; delivered 400 tons of supplies and fuel, and shipped 53 tons of freight. She was 52 days employed in attending to the electric buoys at Sandy Hook, 11 days in changing and serving light-ships, and 79 days at the general depot painting buoys, preparing shipments, and storing supplies. The other working days of the year were devoted to the buoy service and deliveries stated, marking wrecks, supplying Romer Beacon with gas, and in attendance on day beacons and post lights. She made 33 trips for the inspection of lights, steamed some 7,861 miles, and consumed about 501 tons of coal. Her duties were well performed, and she is kept in excellent condition. The boiler and machinery of the vessel were repaired, and she is now in good order. During the year the *John Rodgers* received provisions, fuel, ship chandlery and supplies from the general store. Advantage was taken of the time required for repairing the boilers and machinery of the vessel, to dock, clean and paint her bottom with two coats of McInnes paint.

The Cactus.—This steamer was constantly employed. She changed or replaced 291 buoys, delivered 550 tons of coal and 28 cords of wood; made 43 deliveries of rations and 192 of incidental supplies; made 264 visits of inspection, towed and changed light-ships, as required; attended to the day beacons in the eastern section of the district, and located, supplied, and repaired post lights. In addition, the buoys and appendages stored at the New London and Newport depots were cleaned and painted by the vessel's crew. In the performance of her work she steamed some 10,825 miles, and consumed about 552 tons of coal. She is kept in excellent condition.

The principal need of the *Cactus* is a new boiler, and this is being made under contract at Newburg, N. Y. She received during the year provisions, fuel, ship chandlery and supplies from store.

The Gardenia.—This steamer was kept in constant service, with the exception of 37 days, when she was laid up for repairs to her engine and boiler, carrying freight between the general depot and the different lines of transportation in New York Harbor; in making tours of inspection, delivering supplies, and attending to the buoy service as required. The *Gardenia* placed or replaced 190 buoys, cleaned and

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painted 155, and recovered 5 which had drifted ashore. She was for 40 days employed on the cables of the electric buoys, repaired the buoy lamps 26 times, and placed one new electric buoy. She assisted in the work of the Coast Survey for 10 days off Nantucket, Mass. In doing her work she steamed some 9,259 miles and consumed about 444 tons of coal. She is kept in excellent order. A new boiler and connections are now under contract for this vessel, and in addition to these she will need a set of new staves for her stern bearing and a set of new grate bars. The vessel received during the year provisions, fuel, ship chandlery, and incidental supplies.

The Mistletoe.—This steamer was constantly employed on works of repair. She is in as good condition as could be expected in a boat of her age. Some repairs were made on the boiler. During the year she ran some 7,834 miles and consumed about 535 tons of coal.

The Rose, formerly the Grace Darling.—This steamer was constantly employed on works of repair and construction. Some repairs were made on the condenser and filter box. Contracts were made for cutting her in two and lengthening her 15 feet. A new boiler and engine of approved pattern, with shaft and wheel, are to be put in. During the year she ran some 5,483 miles and consumed about 264 tons of coal.

The Nettle.—Ordinary repairs were made to the tiller-box and hull of this steam launch. She was mostly employed on repairs in Lake Champlain and Hudson River. During the year she ran some 2,477 miles and consumed about 23 tons of coal.

Tender for the third light-house district.—A new steel screw steamer is needed to take the place of an old side-wheel steamer. The latter has been nearly worn out by long and hard service in the waters of Long Island Sound and on the seacoast of New York. She is too small to do the work of the third light-house district properly. She is so slow that a great deal of time is lost unnecessarily. The needs of this district, which is the largest and most important of the country, would be far better and more economically subserved by a steamer of the latest design. It is estimated that such a steamer can be built, fitted out and made ready for service at a cost not exceeding \$95,000, and it is recommended that an appropriation of this amount be made therefor.

FOURTH DISTRICT.

The fourth district extends from Shrewsbury River, New Jersey, to and including Metomkin Inlet, Virginia, and embraces all the aids to navigation on the seacoast of New Jersey below the Highlands of Navesink, on the Delaware Bay, the Delaware and Schuylkill rivers, the seacoasts of Delaware and Maryland, and part of the seacoast of Virginia.

Inspector.—Commander Purnell F. Harrington, U. S. Navy.

Engineer.—Capt. Frederick A. Mahan, Corps of Engineers, U. S. Army, to December 31, 1891; Capt. Edward Maguire, Corps of Engineers, U. S. Army, from December 31, 1891.

In this district there are:

Light-houses and beacon lights, including 7 post lights	56
Light-ships in position	4
Day or unlighted beacons	5
Fog signals operated by steam or hot-air engines	5
Fog signals operated by clockwork	7
Whistling buoys in position	4
Bell buoys in position	6
Ice buoys for winter use	10
Other buoys in position	175
Steamer <i>Zizania</i> , buoy tender and for supply and inspection	1
Schooner <i>Cloror</i> , for construction and repairs	1

LIGHT-HOUSES.

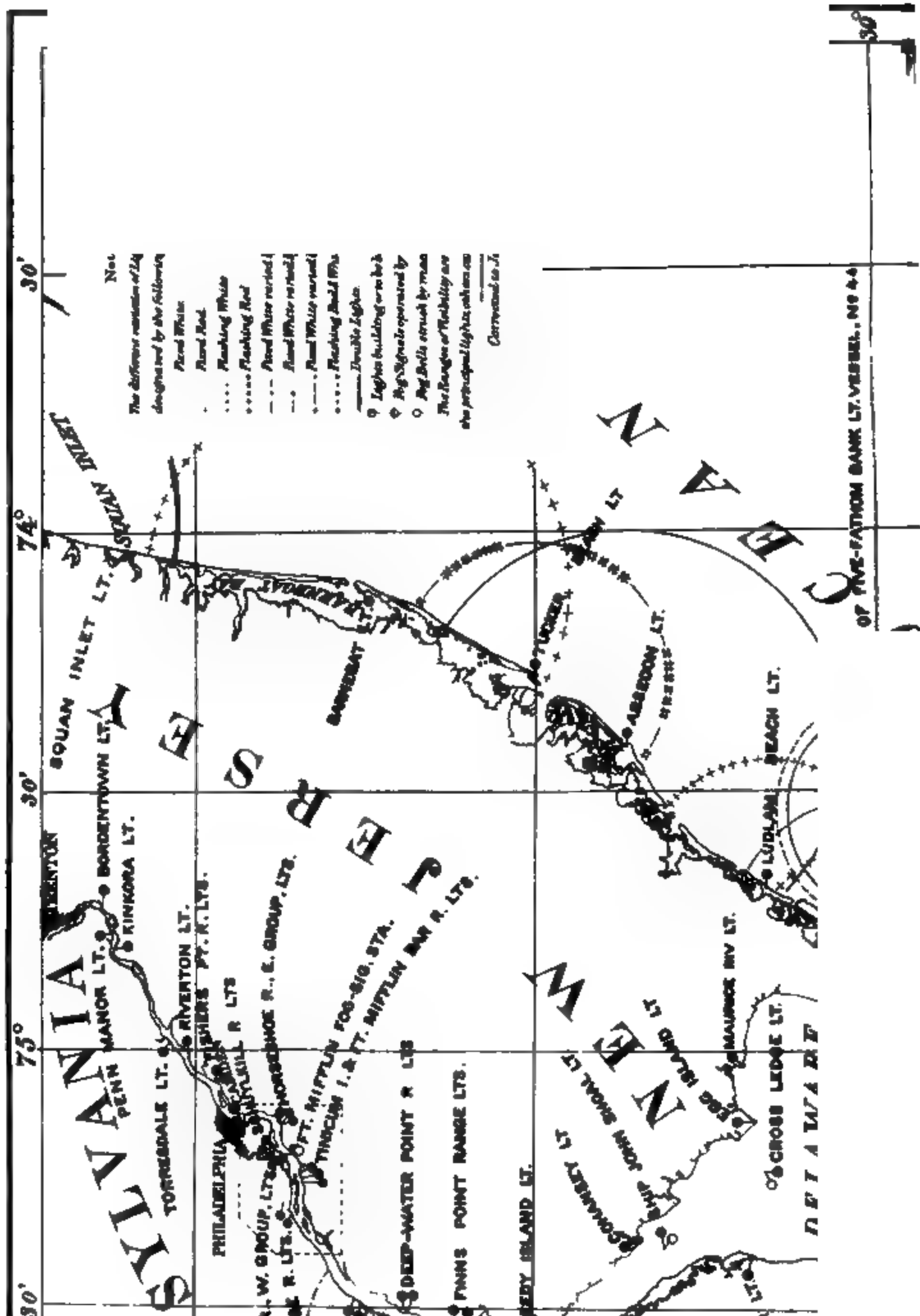
312. *Squan Inlet, seacoast of New Jersey.*—A new site was selected. Measures were taken for its purchase and for obtaining title.

313. *Barnegat, Barnegat Inlet, seacoast of New Jersey.*—The roof and porches of the dwelling were renewed and repairs were made to its interior. A frame kitchen addition was also built. New quarters for the assistant keepers are urgently needed at this station. It is estimated that a proper structure can be erected for \$4,000, and it is hoped that the general appropriation for repairs of light-houses may be sufficient to enable the Board to defray the expenses therefrom.

315. *Absecon, Absecon Inlet, seacoast of New Jersey.*—Two jetties on the beach front, 200 and 300 feet long respectively, were built to protect the reservation against threatened encroachments of the sea. Work was begun towards the close of the fiscal year upon the additions to the assistant keepers' dwelling.

—, *Big Oyster Beds, mouth of Maurice River, Delaware Bay, New Jersey.*—The following recommendations made in the Board's last four annual reports are renewed:

It would be largely to the interests of the oyster men of Maurice River to establish a light and fog signal at or near the southern edge of Big Oyster Beds. It would be desirable also to place a beacon light, with a lantern on it which would burn eight days, to mark the entrance to the river. The light on Big Oyster Beds should



FIVE-FATHOM BANK LT. VESSEL - NO 44

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be erected on a strong foundation, to resist the push of floating ice, and would cost, it is estimated, about \$25,000. On the exhibition of this light the Maurice River light could be discontinued.

It is recommended that an appropriation of this amount be made therefor.

354. *Delaware Breakwater, rear range, Delaware Bay, near Lewes, Delaware.*—The frame barn was rebuilt. Various repairs were made.

355. *Mispillion Creek, at mouth of the creek, Delaware Bay, Delaware.*—A portion of the site was filled in with gravel and it was graded.

356. *Brandywine Shoal, Delaware Bay, Delaware.*—The characteristic of the light was changed on June 20, from fixed to fixed during periods of seventeen seconds separated by an eclipse of three seconds' duration. No change was made in the order of the light nor in the red sector.

357. *Fourteen-Foot Bank, Delaware Bay, Delaware.*—The light at this station was changed from flashing every fifteen seconds to fixed for a period of forty seconds' duration, followed successively, by an eclipse of three seconds, fixed period of fourteen seconds, and an eclipse of three seconds. Neither the order of the light nor the red sector were changed.

360. *Cross Ledge, east side of channel, New Jersey.*—On June 20 the light was changed from fixed to fixed during a period of seventeen seconds, separated by eclipses of three seconds. No change was made in the order of the light nor in the red sector.

361. *Mahon River, mouth of the river, Delaware Bay, Delaware.*—The site under and around the house for about 25 feet beyond the building line was filled in with marsh mud to a height of about 4 feet. The top surface was protected with a covering of oyster shells about 6 inches deep. Cut-offs were placed in the cistern conductors.

362. *Ship John Shoal, Delaware Bay, New Jersey.*—The characteristic of this light was changed from fixed, to fixed of fifty-seven seconds' duration, succeeded by an eclipse of three seconds. Neither the order of the light nor the red sector were changed.

— *Salem Creek Light-Station, southern side of Salem Creek, Delaware Bay, New Jersey.*—The mouth of the creek is hard to find at night and vessels wait all night outside or ground in attempting to enter. This causes loss or inconvenience. The quantity of commerce to and from Salem will amply justify the establishment of a beacon light here. It is estimated that such a light can be established for not exceeding \$800, and it is recommended that an appropriation of this amount be made therefor.

— *Reedy Island Range Light, near Port Penn wharf, Delaware River, Delaware.*—Urgent representations were made to the Board by the various interests concerned in the navigation of Delaware bay and river as to the need of a rear light to form a range with Reedy Island light to mark the turning point of Bakers Shoal. It was claimed that a light placed near Port Penn wharf would effect this purpose. The Board

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caused careful examination of the matter to be made by the officers of the Fourth Light-House District. The conclusion reached and the report made was to the effect that the proposed light is much needed. This is emphasized by the fact that a fine steamer recently grounded on Bakers Shoal under circumstances which lead to the belief that, had the proposed light been in use then, this disaster would have been prevented. It is estimated that it would cost not to exceed \$10,000 to establish a rear light to range with Reedy Island light as proposed, and it is recommended that an appropriation of this amount be made therefor.

NOTE.—The appropriation recommended in the foregoing paragraph was made in the sundry civil appropriation act, approved on August 5, 1892. The Board has taken the proper measures to have the Reedy Island Range Light established as soon as practicable.

375. *Christiana, mouth of Christiana River, Delaware Bay, Delaware.*—The dwelling at this station was overhauled and put in thorough repair. The river banks were put in good order and the site around the house was graded.

376. *Cherry Island, front range, Delaware River, Delaware.*—The keeper's dwelling at this station, destroyed by fire in August of last year, was rebuilt.

378. *Schooner Ledge, front range, Delaware River, Pennsylvania.*—The side and rear protecting walls were rebuilt and pointed on the inside and the site was filled in and brought to a uniform grade. A new drain was laid.

400. *Fenwick Island, seacoast of Delaware, 20 miles south of Cape Henlopen, Delaware.*—A wooden pile bridge, about 225 feet long and 12 feet wide, with a draw span of 34 feet, was built to connect the island with the mainland and give access to the station. A frame kitchen was added to the assistant keepers' dwelling and the fences were renewed.

402. *Assateague, Assateague Island, seacoast of Virginia.*—A small brick oil house was erected, 14 by 18 feet in plan, and the frame barn was rebuilt.

REPAIRS.

Repairs, more or less extensive, were made at each of the following-named stations during the fiscal year:

344. Tucker Beach, N. J.
350. Cape May, N. J.
351. Cape Henlopen, Del.
352. Delaware Breakwater, Del.
358. Maurice River, N. J.
359. Egg Island, N. J.
364. Bombay Hook, Del.
365. Port Penn, front range, Del.
366. Port Penn, rear range, Del.
367. Reedy Island, Del.

368. Finns Point, front range, N. J.
370. New Castle, front range, Del.
371. New Castle, rear range, Del.
374. Christiana Pierhead, Del.
379. Schooner Ledge, rear range, Pa.
381. Tinicum Island, rear range, N. J.
387, 388, 389. Horseshoe Range, east group, N. J.
390, 391. Schuylkill River, front and rear range, Pa.

Fourth District.**LIGHT-SHIPS.**

348. *Northeast end of Five-Fathom Bank Light-Vessel, No. 44, off the seacoast of New Jersey.*—Some 36 tons of coal and a cord of wood were furnished for the use of the fog signal and vessel. Paint, sheet gum, medicine, rope for the use of the crew, 8 light-vessel lamps, 3 plates of glass for the lantern were supplied, and 100 feet of 1½-inch hose.

349. *Five-Fathom Bank Light-Vessel, No. 40, off the seacoast of New Jersey.*—About 41½ tons of coal and a cord of wood were furnished for the use of the vessel and the fog signal. Oilcloth for the cabin floor, a stove for the cabin, hose, windsail, and 6 light-vessel lamps were supplied. Four lamps and a reflector were repaired.

399. *Fenwick Island Shoal Light-Vessel, No. 37, off the seacoast of Maryland.*—The annual allowance of provisions for 8 men was furnished. A surge reliever for 1½-inch mooring chain, 16 tons of coal, a cord of wood, paint, dishes, medicine, rope, 85 feet of chain for lanterns, 6 life-preservers, 6 plates of glass for lanterns, and 6 light-vessel lamps were supplied. This vessel will soon be replaced by a steam-propeller light-vessel with modern improvements, the vessel now being constructed at West Bay City, Michigan.

401. *Winter-Quarter Shoal Light-Vessel, No. 45, off the seacoast of Virginia.*—This vessel was removed from her station for repairs on August 29, 1891, and arrived at the Edgemoor Buoy Depot on the next day. The Coast Survey schooner *Drift* was placed on the station as a temporary light-vessel. Light-ship No. 45 was docked September 3, and the bottom was found to be in good condition, except a break in the wooden covering under the port sea hawse pipe, which was made when the vessel got under way from her station. The zinc sheathing was much worn, small holes appearing in several places. New zinc was placed over these holes. The vessel was undocked September 5. Two new flues for steam chimneys, were put in, parts of the steam pipes were renewed; a copper feed pipe, a copper discharge pipe, new linings for furnace fronts, a new wrought-iron ladder in the boiler room, new belt and lacing for the engine governor, new rubber rings for the coal-bunker plates, one new steam injector, No. 4 William Sellers & Co., pattern, two surface blow valves, new blowpipe, and a straightway valve and pipe were supplied. Four hand holes were cut in each steam chimney and fitted with plate. An 8-inch Crosby steam-gauge, jacket for whistle drum, and one port shutter, were furnished. The half-deck platform between the boilers was removed. The stands of the boilers were altered. A new Y pipe, a new section of smokestack, and a coil of feed pipe were added. The boilers were covered. The wire jumper stays of the foremast and mainmast were lengthened. New dead eyes were fitted. New boxes and new bolts for the windlass, and strengthening pieces on check pieces of windlass bitts were supplied. The broken

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rail was repaired. The hull was calked from the copper line up to the plank sheer. The seams were payed with red lead, the hoisting gear of the lanterns was changed and the boat was repaired. On October 22, 1891, the vessel was replaced on her station. Two pop safety valves, rope, twine, medicine, canvas, oilcloth for the cabin floor, comfortables, barometer, new galley stove, No. 5 monitor, with fixtures complete, bowls for washstands, boat compass, nails, packing, drills and 6 life-preservers were supplied. The annual allowance of provisions for the keepers and crew was furnished. About 43 tons of coal and a cord of wood were supplied for the use of the vessel and fog signal, and 8 light-ship lamps were furnished.

The Drift.—This schooner, which was borrowed from the Coast and Geodetic Survey, was towed to the Winter-Quarter Shoal light-station by the tender *Zizania*. The schooner relieved light-vessel No. 45 on August 29, 1891. She was in charge of Mr. Mason, the assistant keeper of light-ship No. 45, and she remained on the station until October 12, 1891, when, during a gale of wind, two days after the loss of the U. S. S. *Despatch* near her station, her chain parted. The schooner was put under reefed forestaysail, and ran off south by east from her station. The staysail subsequently split and the schooner scudded under bare poles until Tuesday, 10 a. m., when she was hove to under a close-reefed foresail. The leaking had increased and the pumps gave out. On Wednesday the wind came to the east-southeast, and she ran about 50 miles north by west. On Thursday, the 15th, the wind shifted to northeast and blew a gale, and at 10 a. m., there being $3\frac{1}{2}$ feet of water in the hold, Mr. Mason took the crew in one of the *Drift's* boats to the schooner *Agnes J. Grace*, and they were landed at Fort Monroe, Va. The action of Mr. Mason in abandoning the *Drift* on October 15 was held to be justifiable, as it was bad weather, there was $3\frac{1}{2}$ feet of water in the hold, but one pump was working, the water was gaining, and the crew was worn out. The damage to the *Drift* which caused the leaking was chiefly about the bow, where she was strained at her anchor by the shock of the heavy seas. When recovered, the *Drift* was found to be in good condition, except the leak referred to in the bows above the copper-line, which admitted water when plunging into a sea. On October 17, the *Drift* was picked up by the barkentine *Daisy Read*, and was towed a few hours and then delivered to the tender *Zizania*, which brought her on October 20 to the Edgemoor buoy depot. Extensive repairs were made to the *Drift*, which put her in good order. The ballast was broken out, cleaned and replaced, and the hold was thoroughly cleaned. A new foresail, a forestaysail, and a jib were supplied. On June 30, the *Drift* was taken in tow by the tender *Zizania* for Portsmouth, Va., buoy depot.

The Argus.—This steam tug was chartered and placed on Winter-Quarter Shoal light-station as a temporary light-vessel and kept there

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from October 19 to 22, 1891, inclusive, when she was relieved by Light-Vessel No. 45.

DAY OR UNLIGHTED BEACONS.

Cape Henlopen day beacon.—This beacon was entirely rebuilt, without change in the character of the structure. It was erected upon and fastened to four small concrete piers which were built upon an old rubble masonry foundation discovered upon the site.

Broadkill, mouth of Broadkill River, Delaware Bay, Delaware.—The day mark at this point was rebuilt. The new structure conformed to the old.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

348. *Northeast end of Five-Fathom Bank Light-Vessel No. 44, New Jersey.*—This 12-inch steam whistle was in operation about 519¾ hours and consumed about 29½ tons of coal.

349. *Five-Fathom Bank Light-Vessel, No. 40, New Jersey.*—The 12-inch steam whistle was in operation about 393¼ hours and consumed about 23½ tons of coal.

352. *Delaware Breakwater, east end, Delaware.*—This second-class Daboll trumpet was in operation about 547½ hours and consumed about 3¼ tons of coal.

357. *Fourteen-Foot Bank, Delaware.*—This second-class Daboll trumpet was in operation about 202½ hours and consumed about 1½ tons of coal.

401. *Winter-Quarter Shoal Light-Vessel, No. 45, Virginia.*—This 12-inch steam whistle was in serviceable condition from October 22, 1891, to June 30, 1892, eight months and ten days. It was in operation about 197½ hours and consumed about 9 tons of coal. The bell was in use on the schooner *Drift* half an hour.

BUOYAGE.

There were maintained last year on the seacoast from Squan Inlet, New Jersey, to Chincoteague Inlet, Virginia, 29 buoys; in Barnegat Inlet, New Jersey, 10 buoys; in Tucker Cove and Little Egg Harbor Inlet, New Jersey, 14 buoys; in Absecon Inlet, New Jersey, 4 buoys; in Great Egg Harbor Inlet and River, New Jersey, 13 buoys; in Hereford Inlet, New Jersey, 5 buoys; in Delaware Bay and River and Schuylkill River, 105 buoys; in Chincoteague Inlet, Virginia, 5 buoys; and in Metomkin Inlet, Virginia, 3 buoys; a total of 188 buoys. The buoyage of Delaware Bay and River, of the seacoast of the district, and of Chincoteague Inlet was kept in order by the light-house steam tender *Zizania*. The buoyage of Barnegat, Tucker Cove, Little Egg

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Harbor, Absecon, Great Egg Harbor, except the outer or sea buoy, a first-class can, and Hereford Inlets on the New Jersey coast was well attended to by contract, as was that of Metomkin Inlet, Virginia. The iron ice buoys were in position in Delaware bay and river and gave satisfaction; 52 were in use during the winter.

DEPOTS.

Edgemoor supply and buoy depot.—The work of arranging the depot and classifying the material was completed. All the unnecessary and useless articles at the depot were, on October 29, 1891, sold at public auction. The outside of the depot was yellow-washed and the roof was painted red. The condemned articles at the Edgemoor Buoy Depot were sold at public auction on October 29, 1891. The net sum will be deposited to the credit of the Treasurer of the United States.

Chincoteague Inlet, Virginia.—The spare buoys for Chincoteague and Metomkin inlets, Winter-Quarter Shoal and Ship Shoal are stored here. It is also used as a depot for Assateague and Killick Shoal light-houses, and for the care of boats from Winter-Quarter Shoal light-ship. The depot occupies half of a small wharf, and the frontage is inadequate to properly accommodate and secure the tender while lying there, and the buoy house is not adapted to the care of the light-ship boats.

Absecon, Absecon Inlet, New Jersey.—The following recommendation made in the Board's last annual report is renewed: An appropriation of \$1,500 was made by the act approved on October 2, 1888, for the purchase of a site and the erection of a buoy depot at this place. It has been found that, after paying for the site and for the legal services incident to its purchase, the balance of the appropriation remaining is insufficient for the construction of a depot building. It is estimated that this work can be done for \$2,000, and an appropriation of that amount is recommended for this purpose.

Cape May, New Jersey.—The following recommendation made in the Board's last annual report is renewed: An appropriation of \$750 was made by the act approved on October 2, 1888, for the purchase of a site and the erection of a boathouse for light-ships' boats at this place. The purchase of the site for a boathouse has been completed, and it is found that the balance of the appropriation is insufficient for the erection of a suitable structure. It is estimated that this work can be done for \$800, and recommendation is made that an appropriation of this amount be made for that purpose.

TENDERS.

The Zizania.—This steamer was on duty throughout the year, except 39 days, during which she was laid up for repairs. In January, 1892, while overhauling and cleaning the vessel, it was found that the back

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leg of the boiler was almost entirely gone. Bids were received to repair the boiler, and the lowest was accepted. The work was well done, and on February 13, 1892, the ship was again placed on duty. On April 30, 1892, she was docked, and the bottom, which was found to be in good condition, was thoroughly cleaned and painted with two coats of germicide paint. The change from composition to iron propellers was effective in preventing further injury from galvanic action about the stern. The sternposts suffered no further injury. The tender was engaged in attending to the buoyage of the district, towing light-vessels to and from the stations, and delivering fuel and supplies to light-houses throughout the year. One trip was made to the general light-house depot at Tompkinsville, N. Y., for supplies and buoys. On June 30, 1892, she started with the schooner *Drift* in tow for Portsmouth, Va., buoy depot. She replaced 34 buoys, changed 182, painted 4, placed 10, shifted 3, and removed 6. She also painted Fishers Point post lights. She landed some 111 tons of coal and some 11 cords of wood at 19 light-stations and some 136 tons of coal and 4 cords of wood at 4 light-vessels. The crew was employed 80 days at Edgemoor buoy depot. She delivered the annual allowance of provisions to 4 light-vessels and 11 light-stations. She also conveyed the Light-House Inspector to the light-stations of the district to inspect them, and she delivered the needed supplies to the light-stations. In doing this work she steamed some 14,000 miles and consumed about 834 tons of coal and 8 cords of wood. Supplies, such as rope, oil, waste, soda, paint, baskets for coaling stations, packing, etc., were furnished.

The Laurel.—The extensive repairs to the hull, boiler, and engine, which were in progress at the close of the last fiscal year, under contract, at Wilmington, Del., were completed in accordance with the contract and specifications early in September, 1891. Coal, provisions, oil, etc., were supplied. The vessel left the Edgemoor Buoy Depot on September 12, 1891, for Pensacola, Fla.

The Clover.—This schooner arrived at Edgemoor Buoy Depot on January 21, 1892. After her sails, running rigging, and outfit were stored for safe keeping and the vessel was secured in the basin at the Edgemoor Depot, all the officers and crew, except the mate, were paid off and discharged.

FIFTH DISTRICT.

The fifth district extends from Metomkin Inlet, Virginia, to include New River Inlet, North Carolina, and embraces part of the seacoasts of Virginia and North Carolina, all of Chesapeake Bay, the sounds of North Carolina, and the rivers tributary thereto.

Inspector.—Commander Charles J. Train, U. S. Navy.

Engineer.—Capt. John C. Mallery, Corps of Engineers, U. S. Army, to November 14, 1891; Capt. Eric Bergland, Corps of Engineers, U. S. Army, from November 14, 1891.

In this district there are—

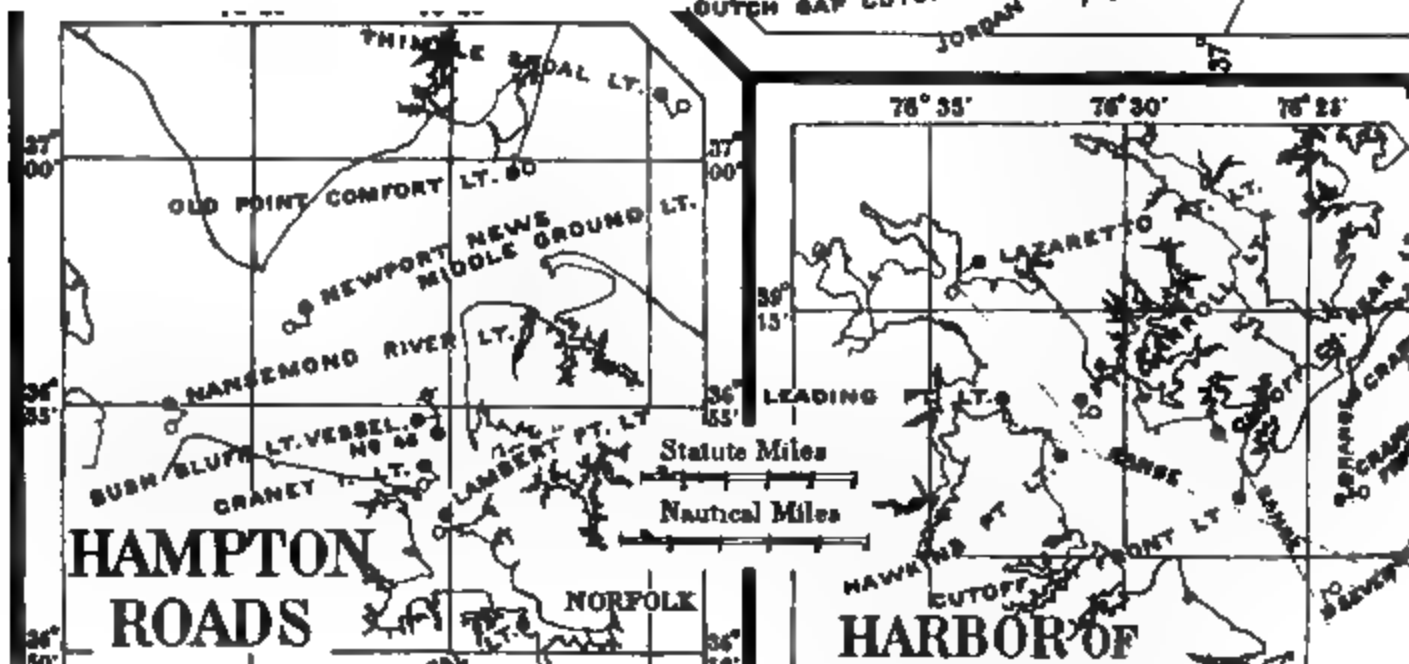
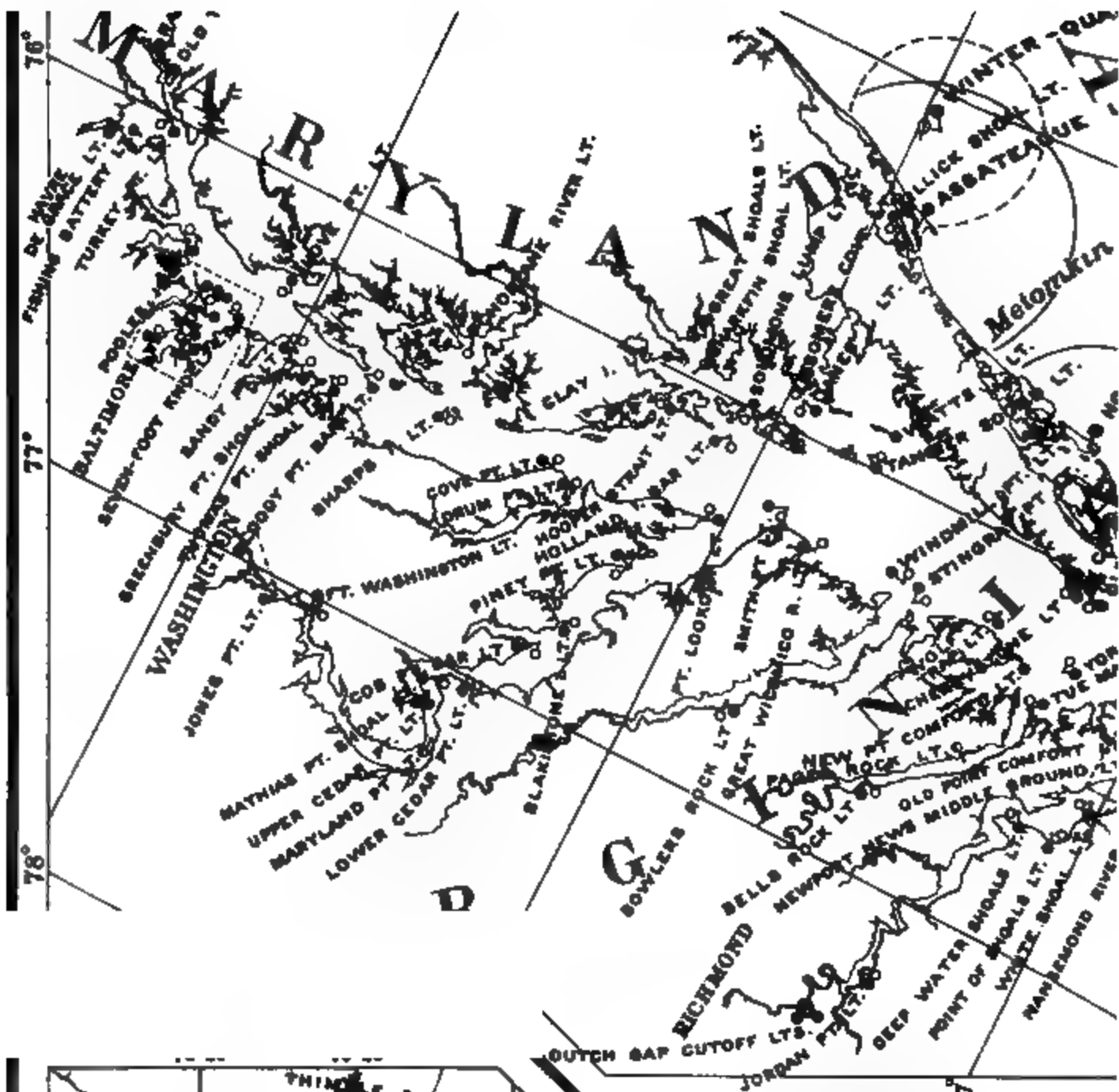
Light-houses and beacon lights, including two post lights	111
Light-ships in position	2
Day or unlighted beacons	14
Fog signals operated by steam or hot-air engines	3
Fog signals operated by clockwork	65
Whistling buoy in position	1
Bell buoys in position	2
Other buoys in position, including pile buoys and stakes	1, 128
Steamers <i>Holly</i> and <i>Violet</i> , buoy tenders, and for supply and inspection	2
Steam-launch <i>Bramble</i> , used to supply gas to the beacons in the sounds of North Carolina	1
Sharpie (and gas tank), for supplying beacons and coast stations	1
Steamers <i>Jessamine</i> and <i>Thistle</i> , for construction and repair	2

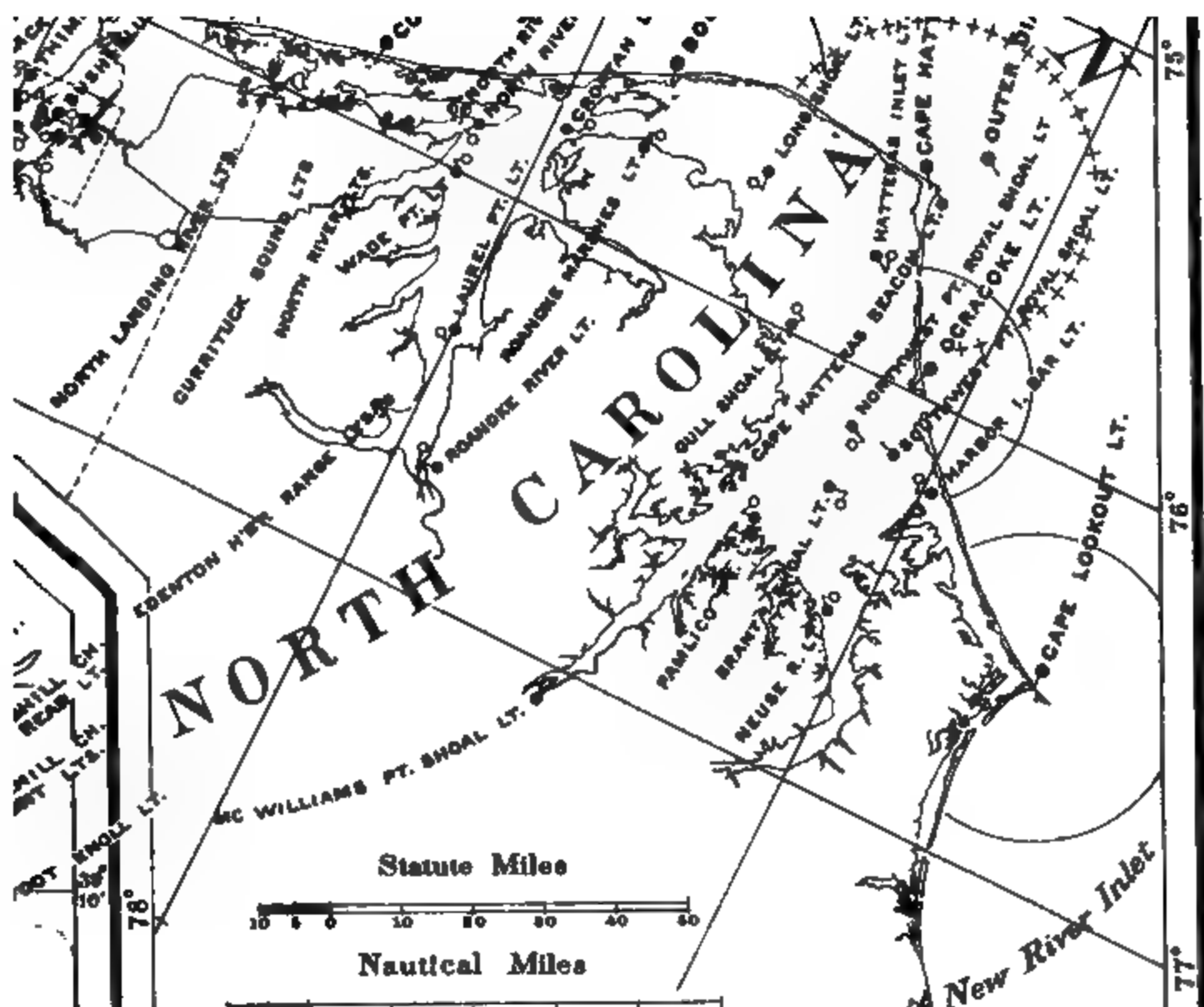
404. *Hog Island, Great Machipongo Inlet, seacoast of Virginia*.—The proper United States attorney reports that the title to the land sought to be acquired for the purpose of building a wharf and roadway at Hog Island is defective. This is the more regretted as the necessary tract was offered to the Government by the holders at a nominal price. It may be necessary to acquire title to this site by condemnation. The full report of the United States attorney is needed before action in the matter.

The following recommendation made in the Board's annual reports for each of the last five years is again renewed:

This light is of little advantage except to vessels running close alongshore. The Board recommends, in order to increase its efficiency as a coast light, the substitution of a first-order light for the present fourth-order light. There are unlighted gaps between this light and Assateague on the north and Cape Charles on the south of about 5 miles and 2 miles, respectively, which a first-order lens, placed on a tower 150 feet high, would illuminate. Its range of visibility, which would be more than 18 miles, would intersect the Assateague light in 18 fathoms of water. A first-order light on that island would be of great assistance to vessels trading on that coast. It is estimated that a first-order light can be substituted for the present fourth-order light at Hog Island at a cost of \$125,000.

It is recommended that this amount be appropriated therefor.





Fifth District,

406. *Cape Charles, on Smith Island, entrance to Chesapeake Bay, sea-coast of Virginia.*—In June a red band, 25 feet wide, was painted around the tower about 60 feet above its base, that mariners may the more readily distinguish this tower in the daytime. Various repairs were made. The station requires general repairs, which, however, will not be made at present, in view of the projected removal of the station to a new site. The plan of the new tower which is to be erected about three-quarters of a mile from the present light-house, which is endangered by the steady advance of the sea line, has been determined upon and the requisite drawings and specifications are now being made. The designs for the new dwellings will be taken in hand soon. One of the owners of the land required for the new site died during the past year, leaving as one of his heirs a minor. It was found necessary, therefore, in order to save the long delay incidental to a suit in chancery for the sale of the interest of this minor, to acquire title by condemnation. Five commissioners were appointed by the United States district court in Norfolk, Va., to meet at the site on July 12, 1892, to condemn the needed land.

407. *Cape Henry, entrance to Chesapeake Bay, Virginia.*—In November a brick oil-house was built, 15 feet 6 inches by 13 feet 6 inches in plan, with space for five hundred 5-gallon oil cans. A new summer kitchen was erected. Repairs of a general character were made.

412. *Lambert Point, Elizabeth River, Virginia.*—The light-house is out of level, owing to the weakening of its foundation by the extension, in 1885, of the coal piers of the Norfolk and Western Railroad Company up to and around the structure. Another storage shed has recently been built by the company, which entirely deprives vessels approaching the light-house from up the river of the benefit of its light. Considering the limited extent of its utility it seems inadvisable to incur longer the expense of its maintenance. It has therefore been decided to discontinue this light.

— *Dollers Point and Hog Island Wharf, James River, Virginia.*—The following recommendations made in the Board's annual report for the last two years are renewed:

Lights have been maintained at these points for several years by private enterprise, and their value to the public interests of navigation is now evident. It is therefore recommended that proper measures be taken for establishing range lights at Dollers Point, to guide vessels through the narrow and shallow channels known as Goose Hill Slough, between Hog Island and Jamestown Island; also for the establishment of an inexpensive light on the wharf at Hog Island, to lead the way through another difficult channel from Deep-Water Shoals Light to the north point of Hog Island, where an abrupt turn is made to enter Goose Hill Slough. The estimated cost of these lights is \$2,500, and it is recommended that this amount be appropriated therefor.

419. *Jordan Point, James River, Virginia.*—The lower side of the point is being eroded rapidly by the current of the river. The safety

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of the buildings of the light-station is threatened. It is proposed to take measures at once to prevent the further encroachment of the water upon the light-house site.

426, 427. *Cape Charles City Range, Virginia.*—The work of framing the rear beacon was commenced at the Lazaretto depot in August and concluded in September. By the end of September much of the material was landed at the site. On October 16 both beacons were in position ready for use. They were lighted on October 31 in accordance with the notice to mariners. The rear beacon is a wooden structure, in shape a frustum of a square pyramid, 24 feet high. It is painted brown and exhibits a fixed white light from a lens lantern. The front beacon is an iron column, painted white, supporting a fixed white lens-lantern light 14 feet above mean high water.

428, 429. *Cape Charles City Harbor, Virginia.*—For the purpose of indicating the cut entrance to the harbor of Cape Charles City, and thereby supplementing the preceding range which marks the present sailing course across the southern part of Cherrystone bar, lights from tubular lanterns were shown from a bunch of piles placed on the south side and from another bunch on the north side of the end of the cut entrance. The south beacon has a fixed white light and the north beacon has a fixed red light.

431. *Pages Rock, York River, about 5 miles from Yorktown, Virginia.*—An appropriation for this work was made by the act approved March 3, 1891. Borings were made at the site during the following summer and again in December, 1891, to ascertain accurately the character of the shoal. This was done to determine the proper structure for the site. The result showed that the foundation was not sufficiently firm to uphold a light-house on screw piles. It therefore became necessary to adopt a structure depending for support upon wooden piles, which could be driven to a hard bearing at a point deeper than the screw piles could be made to penetrate economically. Accordingly, in the spring of 1892, drawings and specifications were made and bids for furnishing the metal work were asked. The lowest bid, \$4,875, was accepted and the contracts were made. A deed for the site was secured from the State of Virginia. No unnecessary delay will be made in doing the work.

432. *Bells Rock, York River, Virginia.*—Early in the spring arrangements were made for putting a red sector into the fixed white light at this station. This change was made on March 10, 1892. Various repairs were made.

451. *Maryland Point, Potomac River, Maryland.*—Bids for furnishing the metal work needed in building this light-house were opened on July 22, 1891. The lowest bid received was \$8,475. The work was to be completed and delivered within five months after the approval of the contract. This period expired January 11, 1892; but owing to una-

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voidable delays, the material was not received until March 12. Work on the superstructure was carried on meanwhile at the Lazaretto light-house depot, but, on account of interruptions made by more urgent work, little progress was made on this until May. It is now nearly done and will be ready for transportation to the site within six weeks. It is expected that the light-house will be in position, ready for lighting, during the coming autumn.

458. *Sharkfin Shoal, between Clay and Bloodsworth islands, Tangier Sound, Chesapeake Bay, Maryland.*—The erection of this light-house was not commenced as soon as anticipated in the last annual report, owing to the need of boring to show the feasibility of placing the light farther south that it might give more aid to mariners. A proper site was found about 2 miles southwesterly from Clay Island light. Proper measures were taken to secure title to this site and cession of jurisdiction from the State of Maryland. This was not done until December, too late in the season to begin work at the site. In May the superstructure, and the working plant required in the erection of the light-house were loaded on scows, and on June 3 were towed, together with the working party, to the site by the tenders. The platform for setting the ironwork was put up and the shears, engine, and boiler were adjusted. The screw piles were placed and secured to the system of beams, braces, and rods which form the foundation. The erection of the superstructure was then begun and at the end of the month it was almost completed. The exterior was practically finished, the lining of the rooms was completed, and the putting in of the partitions was under way.*

— *Point No Point, west side of Chesapeake Bay, between Potomac and Patuxent rivers, Maryland.*—The following recommendation, which was made in the last annual report, is renewed:

There is a stretch of about 30 miles between the Cove Point and Smith Point lights which should be better lighted. For a part of the distance navigators are without a guide, where a deviation from their sailing course might carry vessels of heavy draft on to dangerous shoals. There are many of this class of craft now trading to Baltimore, and their number is increasing. A light-house on the shoal off Point No Point would be a useful warning, and a suitable structure can probably be erected there for \$35,000. It is recommended that an appropriation of this amount be made therefor.

— *Cedar Point, mouth of Patuxent River, Chesapeake Bay, Maryland.*—The following recommendation, made in the last four annual reports of the Board, is again renewed:

The harbor at the mouth of Patuxent River is the best on the western side of Chesapeake Bay. Vessels about to enter this harbor from the south pass close to Cedar Point, where the water is deep near the shore. In thick weather sounding is no safeguard, as the change from deep to shoal water is abrupt. The establishment of

* The light was exhibited on August 1, 1892.

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a light and fog signal on Cedar Point would also be of much value to the general navigation of the bay, as most vessels pass near this point. It is estimated that a proper structure would cost \$25,000.

It is recommended that this amount be appropriated therefor.

461. *Cove Point, entrance to Patuxent River, Maryland.*—A substantial wooden shore protection was built in November to arrest the further advance of the sea upon the light-house site. This was composed of 4-inch sheet piling, 12 feet long, forced into the ground and backed by 6-inch waling pieces, bolted to heavy piles, 25 feet long, driven 12 feet apart on a line 340 feet long. The foundation of the fog-bell tower, the piers of which had already been reached by the water line, was moved back 16 feet. The structures at the station were thoroughly repaired. Some 420 running feet of new fence, with two gates, were built, and the old walks were renewed. The tower and dwelling were put in complete order.

466. *Greenbury Point Shoal, entrance to Severn River, Chesapeake Bay, Maryland.*—At the date of the last annual report, the superstructure of this light-house had been prepared at the depot, and the ironwork was ready for erection at the site. On July 28, 1891, the position of the new structure was fixed and the work on the foundation was begun. On August 6, the piles were in place: but it was noticed while the piles were being driven that the shoal failed to give the resistance needed for a safe support for the structure. The work was therefore stopped until means of strengthening the foundation were provided. For this purpose the method which was successful at Gull Shoal, North Carolina, under similar conditions, was adopted. This method was by means of cast-iron disks, of as great diameter as the spaces between the parts of the ironwork would allow, to which cast-iron sleeves were fastened securely. The sleeves and disks were then slipped on over the piles, and forced down until the disks had obtained a solid bearing on the shoal. The sleeves were then firmly bolted to the piles. In this way the bearing surface was largely increased. This made a delay of nearly six weeks, and work was not resumed on the light-house until September 14, 1891. The sleeves and disks were adjusted, the rest of the ironwork was put in position, and then the erection of the house frame was carried rapidly forward. The work was completed on October 8, except the painting and the removal of the working platform. The platform was taken down by the two men left in charge of the station pending the arrival of the keeper, and the painting was done on October 19, during the visit of the tender *Jessamine*. The light was exhibited for the first time on the night of November 15, 1891, as announced by the notice to mariners. The structure comprises an hexagonal wooden dwelling on seven screw piles, supporting a lantern, showing a fixed white fourth-order light. The fog bell is struck by machinery, a double blow every ten seconds. The station on shore at

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Greenbury Point was discontinued when the new light was shown. The old light-house will be retained as a day mark.

— *Swan Point Bar, east side of Chesapeake Bay, opposite Bodkin Point, Maryland.*—The following recommendation made in the Board's annual reports for each of the last four years is renewed:

Swan Point Bar is a very important turning point for vessels navigating the bay. Steamers reach it by long courses, whether approaching it from the north or south. A light on the extreme point of the bar, in about 12 feet of water, would be of great use to vessels navigating the bay, whether bound for Baltimore or for other points. This location is exposed to the large fields of ice which move in the bay. A structure strong enough to resist them it is estimated will cost \$50,000.

An appropriation of this amount is recommended therefor.

— *Baltimore Light and Fog-Signal Station, Patapsco River, Chesapeake Bay, Maryland.*—The following recommendation made in the Board's last two annual reports is renewed:

The principal difficulty in the navigation of the Cutoff Channel occurs at its junctions with the Craighill and Brewerton channels. At these places the channel has been widened, and the intention is to still further increase the width. For vessels of small draft there is no difficulty in entering or leaving Baltimore Harbor. It is only in the daytime, when it is difficult to distinguish the buoys which mark the turning points, and for large steamers, that additional aids to navigation are needed. A light-house is most wanted at the mouth of the Cutoff Channel, i. e., where this channel joins the Craighill. On account of the impassible character of the shoal, and the liability to damage or destruction by fields of moving ice, no light-house, other than an expensive one, can be made permanent. The estimated cost of a suitable structure is \$60,000, and an appropriation of this amount is recommended therefor.

475. *Hawkins Point, Brewerton Channel range, Patapsco River, Maryland;* 476. *Leading Point, Patapsco River, Maryland.*—In July, 1891, the brush and trees were removed from a strip 65 feet wide extending across Hawkins Point, to open the range for Brewerton Channel formed by these lights.

477. *Lazaretto Point, Baltimore Harbor, Maryland.*—An iron oil house was erected in May. It is 9 feet wide, 12 feet long, and 9 feet high, with a capacity of about 450 five-gallon cans. Extensive repairs and alterations were made at the station. The dwelling was improved by putting on it an overhanging roof. A new hearth, mantel, and sink, with pipe connections, were provided for the kitchen. The well fixtures were entirely renewed. Some 240 feet of new picket fence were built. Some 60 feet of wooden walks were laid. A building, 13 feet 7 inches by 30 feet in plan, with projecting shingled roof, was erected for use as a summer kitchen and a fuel storehouse. The buildings were thoroughly painted.

478. *Pooles Island, off the mouth of Gunpowder River, Chesapeake Bay, Maryland.*—In August a boathouse was built and a windlass was provided for hauling up boats. Various repairs were made.

481. *Havre de Grace, at the mouth of Susquehanna River, Chesapeake Bay, Maryland.*—On October 28, 1891, the sixth-order lens was replaced

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by one of the fifth order to increase the efficiency of the light. Various repairs were made.

484. *Currituck Beach, seacoast of North Carolina.*—Some 3,000 running feet of fence were renewed. Various repairs were made.

486. *Cape Hatteras, seacoast of North Carolina.*—One of the kitchens forming the wings of the assistant keepers' dwelling was moved to the rear, and changes were made to adapt it to the use of two families.

The main building was extended on its front and back lines about 16 feet; the inclosure constituted an addition 16 feet by 20 feet 3 inches in plan and two stories in height. This provided comfortable quarters for the assistant keeper in charge of the Cape Hatteras Beacon, whose previous accommodations were scant. A brick oil house was built 15 feet 6 inches by 13 feet 6 inches in plan, with walls 8 feet 6 inches high and 9 inches thick, and a gable roof 4 feet high. The principal keeper's dwelling, the old parts of the assistant's dwelling, and the tower were put in complete order. One of the storehouses was moved from near the tower to the vicinity of the principal keeper's dwelling, and various repairs were made at the station.

488. *Outer Diamond Shoals, off Cape Hatteras, North Carolina.*—Since the destruction of the caisson on July 8, 1891, reported in the Board's last annual report, no further attempt was made to erect this light-house.

491–500. *Beacon Lights in North Landing River, Virginia, and Currituck Sound and North River, North Carolina.*—Extensive repairs and improvements were made. A new compressor engine, boiler, and gas holder were purchased and set in place. A retort house 12 feet square was built. The boathouse was repaired and prepared for the reception of the new compressor. The old boiler was transferred from the boathouse to the brick retort house to prevent danger from fire. The dock near the boathouse was protected by sheet piling. The gas apparatus is now in excellent condition. There are two effective compressors, two reliable boilers, and a good gas holder. Should either engine or either boiler give out, its duplicate can be set to work. No risk of a failure of the lights is likely to occur. Various repairs were made.

501. *North River Bar, entrance to North River, North Carolina.*—Plans for the range beacons to guide over this bar have been made. They will be built during the coming winter.

504. *Laurel Point, Albemarle Sound, North Carolina.*—A fuel platform was built under the light-house.

505, 506. *Edenton Harbor Range, Albemarle Sound, North Carolina.*—A new copper-wire rope for hoisting the lantern at the rear beacon was furnished in February.

— *Alligator River, at or near Great Shoal, mouth of Alligator River, North Carolina.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

There are no lights on the south side of Albemarle Sound, between Croatan and

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Laurel Point light-houses, a distance of about 30 miles. Alligator River furnishes the only harbor in this distance. The general and local interests of navigation are of sufficient magnitude to justify the erection of a light-house at this locality. It can be built at an estimated cost of \$20,000. Recommendation is made that an appropriation of this amount be made therefor.

— *Pork Point, on the shoal known as the Blockade, off Pork Point, on Roanoke Island, Croatan Sound, North Carolina.*—The following paragraph from the Board's reports for the last five years is repeated and the recommendation therein renewed:

There are eleven steamers running regularly, together with a large number of sailing vessels passing this point. Much property has been destroyed and many serious accidents have occurred in the vicinity for the want of a light, and the navigation of these waters is dangerous and much dreaded. The obstructions to the westward of the narrow channel, constructed during the war of the rebellion, have never been removed. This is also a turning point for vessels navigating the sound, and steamers, after leaving Croatan and Roanoke Marshes lights for this point can make it by steering a single course only. The Board, therefore, is of opinion that a light-house and fog signal should be established here, and it is recommended that an appropriation of \$20,000 be made for the purpose.

518. *McWilliams Point Shoal, Pamlico River, North Carolina.*—The light-house authorized for the Middle Ground off McWilliams Point to mark the entrance to Washington, N. C., was established May 15, 1892. The light is fixed white and is shown from a wooden pile, 30 feet long, driven 13 feet into the shoal. The pile stands in 8 feet of water and is provided with the necessary support for a tubular lantern and with a ladder for attending to the light.

— *Wreck Point, southeast of Cape Lookout, North Carolina.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

The establishment of a small light on this point would be of great assistance to a large number of vessels that seek a lee under Cape Lookout. A suitable structure can not be built at this isolated site for less than \$5,000. It is recommended that an appropriation of that amount be made therefor.

— *Beaufort Harbor, North Carolina.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

The harbor of Beaufort, N. C., is the only one of importance between Chesapeake Bay and Wilmington, N. C., a distance of some 200 miles. It is the natural outlet to the inland commerce of northern and middle North Carolina, and affords a refuge for vessels overtaken by storms on this exposed coast. A large number of coasting vessels from the North Carolina rivers and sounds pass out to sea by this harbor, thereby avoiding the dangerous navigation outside of capes Hatteras and Lookout. The annual commerce of this port is about \$1,000,000. The depth of water at low tide is 13 feet 6 inches, and the width of the channel at the bar entrance is 1,000 feet. The inlet width is 7,000 feet, and there is good anchorage inside in 25 feet at low water. The channel across the bar is straight, and if properly marked by range lights it would be the safest and easiest harbor to enter between Cape Henry and Savannah. The estimated cost of establishing the necessary lights is \$10,000. It is recommended that an appropriation of this amount be made therefor.

Fifth District.**REPAIRS.**

At each of the following-named stations repairs, more or less extensive, were made during the year:

409. Old Point Comfort, Va.	469. Craighill Channel (front), Md.
413. Naval Hospital, Va.	470. Craighill Channel (rear), Md.
414. Newport News Middle Ground, Va.	471. Seven-Foot Knoll, Md.
434. Wolf Trap, Va.	474. Fort Carroll, Md.
453. Jones Point, Va.	479. Turkey Point, Md.
456. Great Shoals, Md.	487. Cape Hatteras Beacon, N. C.
460. Drum Point, Md.	489. Ocracoke, N. C.
468. Love Point, Md.	490. Cape Lookout, N. C.
	511. Hatteras Inlet, N. C.

LIGHT-SHIPS.

405. *Cape Charles Light-Vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This vessel was on her station throughout the year and did her work in a satisfactory manner.

410. *Bush Bluff Light-Vessel, No. 46, entrance to Norfolk Harbor, Elizabeth River, Virginia.*—This vessel was placed on her station July 16, 1891, and has been there ever since.

— *Cape Lookout Shoals Light-Vessel, North Carolina.*—Cape Lookout shoals extend 8 miles beyond the point of the cape. There are dangerous breakers on the shoals 5 miles from the cape. When a vessel drawing more than 15 feet of water has made sufficient offing to just clear these shoals, she is 10 miles distant from the Cape Lookout light. Although this light is of the first order, shown from a tower 150 feet high, and should be seen a distance of 18 miles under favorable circumstances, it may happen during thick or hazy weather that a mariner may fail to see it in time to avoid that line of shoals. A light-ship of the improved model now constructed for use at exposed stations and provided with a steam fog signal, to cost \$70,000 approximately, would be a valuable aid to navigation, if placed near the southern extremity of the shoals. It is therefore recommended that an appropriation of that amount be made therefor.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

405. *Cape Charles Light-Vessel, No. 49, entrance to Chesapeake Bay, Virginia.*—This 12-inch steam whistle was in operation some 286 hours during the year, and consumed about 27 tons of coal.

407. *Cape Henry, entrance to Chesapeake Bay, Virginia.*—This first-class steam siren, in duplicate, was in operation some 130 hours during the year, and consumed about 12 tons of coal.

410. *Bush Bluff Light-Vessel, No. 46, entrance to Norfolk Harbor, Elizabeth River, Virginia.*—This 12-inch steam whistle was in operation some 124 hours during the year, and consumed 6 tons of coal.

Fifth District.**DAY OR UNLIGHTED BEACONS.**

The beacons were repaired.

BUOYAGE.

The buoyage of the district is in good order. Most of the buoys were changed and all were painted.

DEPOTS.

Lazaretto Point, Baltimore, Maryland.—The old stairway in the storehouse was replaced and various repairs were made. The wharf was repaired. The fender piles were replaced by 21 new ones of white oak. The string pieces and rails along the entire front, some 200 feet in length, were renewed and most of the old decking was cut out and new flooring laid in its place. The tops of the fender piles were sawed off, dressed, and covered with sheet brass, and iron chafing pieces were put on below the metal. The depot is in good condition.

The following recommendation, made in the last two annual reports, is renewed:

Attention is invited to the necessity of providing a dwelling at this depot for the accommodation of the depot keeper and his family. Their quarters in the warehouse are unsuitable and uncomfortable, and even were the rooms not required for other purposes it would cost nearly as much to make them comfortably habitable as it would to build a new dwelling. About one-third of the space on the upper floor is reserved for the use of custom-house inspectors, and the large and increasing amount of work on hand in the district demands the use of all storage and shop room available. The depot keeper must be constantly on the spot, and can not live away from the premises. There is ample room on the Government tract for such a building as is required, and it can be built for \$2,500. An appropriation of this amount is earnestly recommended.

Point Lookout, mouth of Potomac River, Maryland.—This depot is in good order. The new wharf has been completed and answers its purpose admirably.

Portsmouth, Virginia.—The condition of this depot is bad. The storehouse and dwelling are in fair condition, but the dwelling is entirely too small. The coal and buoy sheds and outhouses are greatly out of repair. Much of the woodwork, including the framing of the houses and sheds, is rotten, and in places entirely gone. In the engineer's storehouse the level of the floor is below the level of the ground of the adjoining property, and the lower ends of the boarding are entirely gone. The floor should be raised at least 1 foot and the house repaired. The underpinning of many of the coal and buoy shed posts is rotten, and it will not be long before the sheds will be dangerous. The wooden flooring of the yard abutting the wharf is entirely worn out and needs replacing immediately. The wharf needs replanking in places, and many of the fender piles are entirely rotted out. So far as the extension to the

Fifth District.

buoy depot is concerned nothing whatever has been done to improve the property.

During the year a tract of land measuring 324 feet deep and 95 feet wide on the water front was bought for the extension of this depot. The light-house real estate now comprises the block bounded by Randolph, First, and Henry streets and the Elizabeth River, with the exception of a lot 67 by 106 feet in the northwest corner. The water frontage is about 240 feet.

Washington, North Carolina.—The dwelling house at this depot is in good condition, as is the storehouse. The wharf is worn out and there is no coal or buoy shed. The wharf should be repaired and sheds erected for the protection of coal and iron buoys.

TENDERS.

The Holly.—This vessel steamed some 13,495 miles and consumed about 970 tons of coal. She made 263 visits to light-houses, delivered 128 tons of coal, and 52 cords of wood. She attended to 272 buoys. The fires were hauled from under the boiler 30 days during the year to make slight repairs to the engines and boilers and to clean her bottom. Her crew were employed in painting buoys at the buoy depot while the tender was being repaired.

The Violet.—This tender steamed some 12,580 miles, worked 518 buoys, built 46 beacons, delivered 199 tons of coal and 76 cords of wood, and made 200 visits to lights for inspection and delivery of supplies. She consumed about 546 tons of coal, was under repairs to the engine and boiler 52 days, and worked 29 days at the Portsmouth depot cleaning and painting buoys.

The Bramble.—This little steamer is in good order, her hull and machinery having recently been overhauled. She is employed towing the gas tank to the Currituck gas beacons.

The Sharpie.—This schooner is in good condition.

The Jessamine.—This steamer was engaged in the active prosecution of her duties during the entire year, except for 3 days in July, 3 in April, and 8 in May, when her boiler and machinery were being repaired and her hull and woodwork were being painted. She was employed in the erection of Greenbury Point Shoal and Sharkfin Shoal light-houses and of the lighted beacons at Cape Charles City; in the repairs at Old Point Comfort, Havre de Grace, Turkey Point, Pooles Island, Seven-Foot Knoll, Craighill Channel, Wolf Trap, Windmill Point, Cape Henry, Cove Point, Cape Hatteras, Long Point, Laurel Point, Currituck Beach, Ocracoke, and Hatteras Inlet light-stations; in making borings at Pages Rock light-house site; in placing a red sector in the Bells Rock light; in moving property at Fort Monroe and from the discontinued station at Greenbury Point, and in making inspections at

Fifth District.

light-stations in Chesapeake Bay and tributaries. While thus employed she steamed about 6,640 miles and consumed some 509 tons of coal. In June she was furnished with a new steam launch 27 feet long and 6 feet wide, to replace the gig.

The Thistle.—This steamer was in constant service, with the exception of an interval of 14 days for needed repairs. She assisted in the improvement and repair of Havre de Grace, Hawkins Point, Cove Point, Great Shoals, Fort Carroll, and the North Carolina light-stations, and in the construction of the new light-houses. During the year she steamed about 4,826 miles, with a consumption of some 171 tons of coal.

SIXTH DISTRICT.

The sixth district extends from New River Inlet, North Carolina, to and including Jupiter Inlet, Florida, and includes all the aids to navigation within these limits on the coasts and in the bays, rivers, and harbors of North Carolina, South Carolina, Georgia, and Florida.

Inspector.—Commander James G. Green, U. S. Navy.

Engineer.—Capt. John C. Mallery, U. S. Army, to November 14, 1891; Capt. Eric Bergland, Corps of Engineers, U. S. Army, from November 14, 1891.

In this district there are:

Light-houses and beacon lights, including 138 post lights	196
Light-ships in position	3
Day or unlighted beacons	37
Fog signals operated by clockwork	3
Whistling buoys in position	6
Bell buoys in position	15
Other buoys in position	301
Steamer <i>Wistaria</i> , buoy tender and for inspection and supply	1
Schooner <i>Pharos</i> , for construction and repair	1

LIGHT-HOUSES.

— *Cape Fear, seacoast of North Carolina.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

“ The shoals forming the continuation of this cape for about 18 miles to the southeast are dreaded by shipmasters only a little less than those at Cape Hatteras. At present a light-ship near the outer extremity of the shoals warns vessels of danger and gives them a good point of departure. This aid to navigation can not be dispensed with; but it is not sufficient to insure adequate protection to the large number of domestic and foreign vessels attracted to this point by the considerable and increasing trade of the neighboring port of Wilmington, N. C., because of the small area lighted by it, and because of its liability to be set adrift from its moorings during heavy storms, which is the very time when its light is most needed. The present Cape Fear light (Bald Head), on account of its inland position and want of height, does not cover the shoal, and therefore does not give sufficient warning to vessels when the light-ship may have drifted from her moorings. A first-order light-house built on the pitch of Cape Fear, with a radius of $18\frac{1}{2}$ miles of light, would be seen so far as to give timely warning, and the fact of being near enough to the coast to see it would be a sufficient indication that the observer should make a better offing. Other reasons for a first-order light-house here may be found in the better protection it would afford to the bight lying north of the cape, which has been left dark since the discontinuance of Federal Point light-station in 1880. The proposed light would more than compensate for the one discontinued at Federal Point. It may be proper to add that there is no first-order light-house between Cape Lookout, North Carolina, and Cape Romain, South Carolina, a distance of about 170 nautical miles.



Note

The different varieties of Lights and Fog Signals are designated by the following characters:

- Fixed White
- Fixed Red
- Flashing White
- Flashing Red
- Fixed White varied by White Flash
- Fixed White varied by Red Flash
- Fixed White varied by Red White Flash
- Flashing Bell White
- Double Light

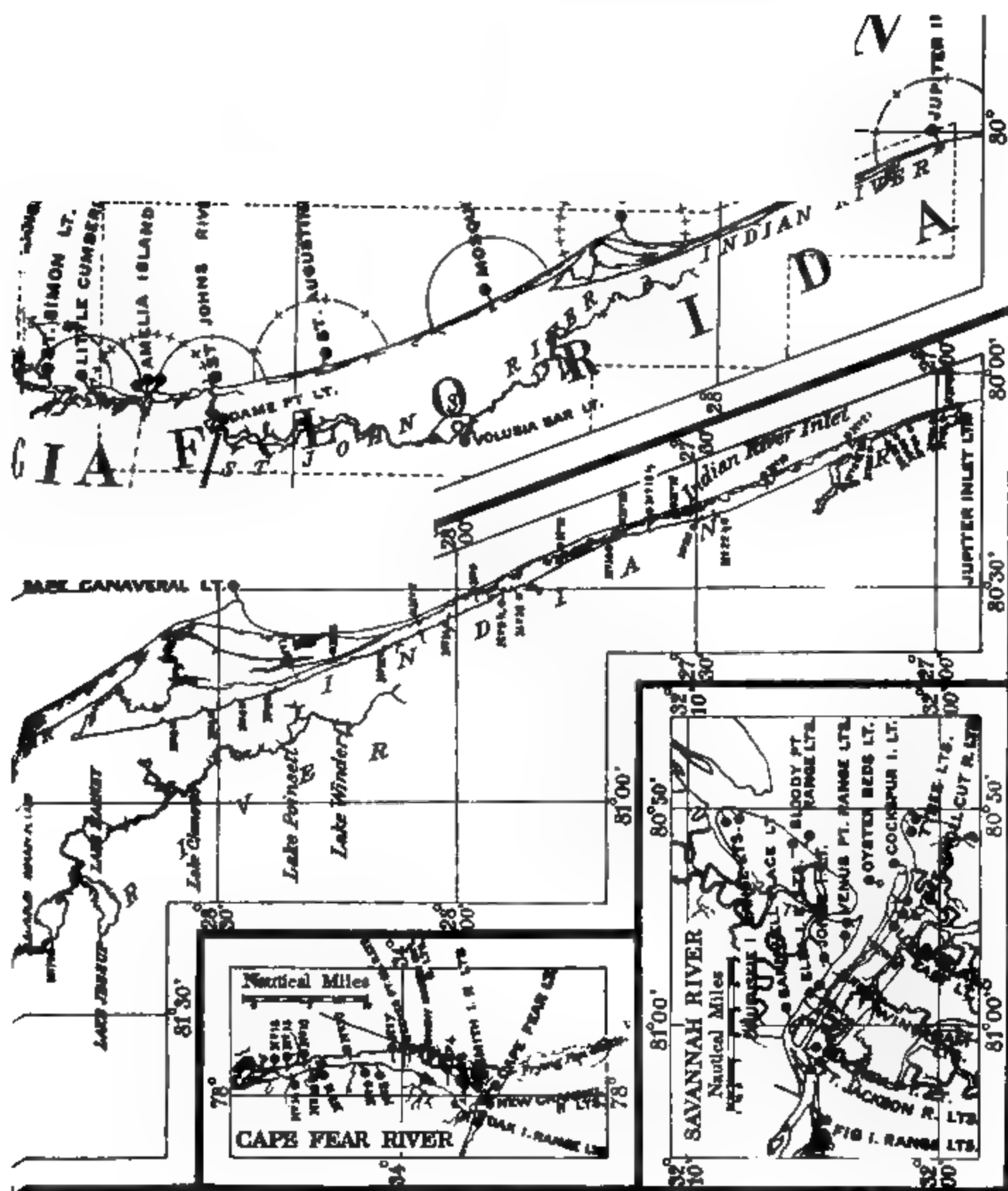
Lights building are in black

Fog Signals operated by steam or electric

Fog Bells struck by machinery

The ranges of flashing are indicated only for some of the principal lights, others can be found in the tables

Corrected to June 30, 1882



Sixth District.

Recent changes in the lighting of the entrance to the Cape Fear River have almost eliminated the Cape Fear light-house (Bald Head) as a harbor light. Its only use is that of a rear beacon to a stake-light forming a range to guide up the river after crossing the bar. Upon the establishment of the proposed new light on the pitch of Cape Fear the old light might be discontinued, as the tower and the keeper's dwelling are antiquated and discreditable to the Light-House Establishment. It is estimated that a first-order masonry tower 150 feet high, with suitable oil room, keeper's dwellings, and outbuildings, on the pitch of Cape Fear, will cost \$150,000, and it is recommended that this amount be appropriated therefor.

Since the last annual report urgent petitions were presented to the Light-House Board by commercial and pilot associations of Wilmington, N. C., and by shipmasters trading to that port, which have had its careful consideration and approval, and the former recommendations are accordingly renewed with emphasis.

521. *Cape Fear, entrance to Cape Fear River, North Carolina.*—The kitchen attached to the keeper's dwelling was almost rebuilt and other slight repairs were made. As it is proposed to discontinue this light upon the establishment of a first-order light-station on the pitch of Cape Fear, no further expense was incurred on this station.

522, 523. *Oak Island Range, mouth of Cape Fear River, North Carolina.*—A new boathouse was built 12 by 18 feet in plan. A fireproof brick oil house was built. It is 9 feet by 11 feet in the clear, with ventilators and drain pipe, and shelves sufficient to receive four hundred and fifty 5-gallon cans. Various repairs were made.

524–543. *Cape Fear River post lights, North Carolina.*—The New Channel Range (524, 525), the Snow Marsh Channel Range (530, 531), and the Reeves Point Channel Range (532, 533), are new and in good condition. The other ranges and post lights were established in 1885 and their piles have begun to decay. As a new system of post lights is proposed for Cape Fear River, which involves the discontinuance of all the present structures above the Reeves Point Range, no steps have been taken for their repair.

The following are the post lights in the Cape Fear River, North Carolina. The general service of these lights has been excellent:

524, 525. New Channel Range.
526, 527. Smith Island Range.
528. Battery Island, No. 3.
529. Lower Swash Channel, No. 4.
530, 531. Snow Marsh Channel.
532, 533. Reeves Point Channel.
534. Upper Drum Shoal, No. 7.
535. Old Brunswick, No. 8.

536. Orton Point, No. 9.
537. Lilliput, No. 10.
538. Campbell Island, No. 11.
539. First Western Jetty, No. 12.
540. Second Eastern Jetty, No. 13.
541. Third Western Jetty, No. 14.
542. Fourth Eastern Jetty, No. 15.
543. Hospital Point, No. 16.

All of these post lights are in very good condition and will need little or no repairs. They are indispensable to night navigation in the river.

— *Range Lights for new dredged channels in the Cape Fear River, North Carolina.*—The Board recommended the discontinuance of 10 of the present post lights in the upper part of the Cape Fear River, and

Sixth District.

the establishment of 24 new post lights, which, in connection with certain other ranges already established, would constitute a system of ranges to guide vessels from the Cape Fear Entrance to Wilmington, N. C., through channels dredged to a depth of 20 feet at mean low water. As vessels are now carried by ranges one-half the distance between the entrance and Wilmington, and then left without further adequate guidance, the Board is of opinion that to complete the usefulness of the aids to navigation in the lower part of the river similar aids should be provided to guide them to their port of destination. It is estimated that this can be done at a cost not to exceed \$3,105, and it is recommended that an appropriation of that amount be made for this purpose.

545. *Sampit River, at junction of Sampit and Pedee rivers, South Carolina.*—The fixed white light of this beacon was changed by substituting for it a fixed red light of the same order.

546. *Cape Romain, seacoast of South Carolina.*—A new boat landing was built, measuring 8 by 60 feet. It is supported by piles sheathed with yellow metal, and is connected with the shore by 95 feet of elevated plank walk. Some 1,340 running feet of picket fence were built. Slight repairs were also made to the dwellings and to the tower. The pedestal of the lens was carefully tested, and no additional deflection of the tower from the perpendicular was detected.

548. *Bull Bay, north end of Bull Island, South Carolina.*—A new picket fence and a new plank platform were put around the keeper's dwelling. A fireproof brick oil-house was built; it is 9 by 11 feet in the clear, with ventilators and drain pipe, and shelves sufficient to receive four hundred and fifty 5-gallon oil cans.

550, 551, 552. *Charleston and Morris Island Ranges, South Carolina.*—Some 1,600 feet of elevated plank walk were built. Various repairs were made. In June the encroachments of the sea upon the site compelled the removal of the front beacon of the south and north ranges, respectively, to points 180 and 175 feet inland.

559. *Sullivan's Island Cove Pierhead, Charleston Harbor, South Carolina.*—This light is shown from the piles of an unfinished and abandoned railroad trestle. The piles were not sheathed and the ship worm has nearly destroyed them.

560. *Hunting Island, entrance to St. Helena Sound, South Carolina.*—A new boat landing was built. It is 10 by 50 feet in plan, supported by 12 piles sheathed with yellow metal. Some 3,200 running feet of wooden tramway were renewed.

562, 563. *Hilton Head Range, seacoast of South Carolina.*—The lantern deck of the front beacon was retinned and 855 feet of elevated plank walk and earthen causeway were rebuilt. A fireproof brick oil house was built. It measures 9 by 11 feet in the clear and has ventilators and drain pipe, with shelves sufficient to receive four hundred and fifty 5-gallon oil cans.

Sixth District.

564, 565. *Paris Island Range, Port Royal Sound, South Carolina.*—A new foundation of 10 piles, with caps, was put under the front beacon. Some 400 feet of elevated plank walk were built and 400 feet more repaired.

566, 567. *Daufuskie Island Range, seacoast of South Carolina.*—Some 284 running feet of new picket fence were built and the boat landing was strengthened. Eight brick piers were put under the front beacon, 210 running feet of new elevated plank walk were built, and 500 running feet of ditches were dug. A fireproof oil house was built. It measures 9 by 11 feet in the clear, has ventilator and drain pipe, with shelves sufficient to receive four hundred and fifty 5-gallon oil cans.

578, 579. *Venus Point Range, Savannah River, South Carolina.*—Changes in the current of the Savannah River have caused so much shoaling along the water front as to require the extension of the boat landings at the front and rear beacons. The shoaling at the landing place of the front beacon has become so extensive that it will soon be necessary to connect the two beacons by a low plank walk running 6,000 feet in a direct line across the low land between the beacons.

582, 583. *Elba Island Range, Savannah River, Georgia.*—The erosion of the water front between the beacons of this range was largely stopped by 17 spur jetties of timber and stone built by the United States engineer in charge of the improvement of the Savannah River.

— *St. Catherine Sound, seacoast of Georgia.*—By an act of Congress approved March 2, 1889, the establishment of a light-station on St. Catherine Island, Georgia, was authorized, but no funds were appropriated for the purpose. The following recommendation for an appropriation of \$20,000 for the establishment of this light, made in the annual reports of the last four years, is therefore renewed:

The distance between Tybee and Sapelo light-stations is 50 miles. The extreme range of these lights so far fails to cover this space as to leave an unlighted gap of 15 miles between them. A light of the fourth order would fill the gap and be of great service to commerce. It should be located near the entrance to St. Catherine Sound, on the south side, as large numbers of vessels trading to Tybee, Sapelo, Doboy, and St. Simon make their landfall near this point. It is estimated that this light can be established at a cost of about \$20,000.

— *Doboy Sound, seacoast of Georgia.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

The two ranges now established take vessels to the intersection of the Wolf Island and the Sapelo Island ranges, and leave them there without guidance in a very dangerous position if they anchor, and with The Knuckles on one side and the Chimney Spit Shoals on the other if they proceed. It is therefore recommended that the front beacon of the present Sapelo Island range be removed to a point where it may be used as a rear beacon of a new range, and that a stake light be established to serve as a front beacon for this new range; also that another range be established higher up the sound, to consist of a steamer lens and lens lantern, respectively, for the rear and front beacons. It is estimated that these new ranges, including sites, will cost \$1,500.

Sixth District.

It is recommended that an appropriation of this amount be made therefor.

597. *St. Simon, entrance to St. Simon Sound, Georgia.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

The establishment of a small light is recommended, to form with the St. Simon light as a rear beacon a range which, while not leading through the best water over the bar, would be of service to small vessels seeking a harbor of refuge at night. It is estimated that the range would cost, inclusive of site, \$1,000.

It is recommended that an appropriation of this amount be made therefor.*

— *The inland passage from Savannah, Georgia, to Fernandina, Florida.*—In its last three annual reports the Board recommended that it be empowered to erect and maintain twenty-five post lights, in order to facilitate the navigation of the inland passage from Savannah to Fernandina, at an estimated cost of \$4,000, and that the appropriation for lighting of rivers be increased by that amount to permit of the establishment and maintenance of these lights. This recommendation is renewed.

599, 600. *Amelia Island Range, south side of Fernandina Entrance, Florida.*—The movement of the sand dunes, which was somewhat checked by the sand fences erected for the protection of the range, still continues to threaten the dwelling, and additional fences are needed. Cracks in cistern walls, caused by the earthquake of 1886, have increased in size and length. Slight repairs were made.

601. *Fernandina Harbor Ranges, Florida.*—In December, 1889, the United States attorney for the northern district of Florida was directed by the Department of Justice to take the proper measures to acquire title to the four light-house sites which had been located on Tiger Island, Florida, for two sets of ranges designed to guide vessels in to the inner Fernandina Harbor. Proceedings in condemnation were instituted, and the United States attorney has at length reported that judgment of condemnation has been entered in this case.†

— *Mount Cornelia, mouth of St. Johns River, Florida.*—The following recommendation, which was in the Board's last three annual reports, is renewed:

The present light-house at the mouth of St. Johns River, Florida, is of the third order, and for years there have been complaints that it was inefficient as a seacoast

* The appropriation recommended in the foregoing paragraph was made in the sundry civil appropriation act which was approved on August 5, 1892. The Board has taken the proper measures to establish the range in question as soon as practicable.

† The Attorney-General of the United States approved the titles by letter dated November 7, 1892.

Sixth District.

light, while as a harbor light the new jetty channel will soon require the establishment of a range to which this structure, on account of location, can not be adapted. It has a small base and stands on marshy ground, and can not be increased sufficiently in height to make it a good seacoast light. A site peculiarly adapted to the erection of a light-house is found near the mouth of the river, on its north side, on Mount Cornelia, which has an extreme elevation of 62 feet above mean sea level, and on which a good foundation with sufficient area for a modern light-station could be had at an elevation of 50 feet above mean sea level. A first-order light-house, with focal plane 150 feet above its base, erected at this point would have a focal plane 200 feet above mean sea level and a 20-mile radius of light. This would intersect with the adjacent seacoast light to the southward, situated at St. Augustine, Fla., better than the present St. Johns River light does, and would practically cover the area now lighted by the adjacent seacoast light to the northward, situated on Amelia Island, Florida, as its area of light would intersect with that of the next most northerly light at Little Cumberland Island, Georgia, and almost touch that of St. Simon, Georgia. The proposed light might thus be made to take the place of two or even three third-order light-houses, all old and unsightly structures, and provide a light second only on the Atlantic coast to that at the Highlands of Navesink, N. J. It is estimated that a first-order masonry tower 150 feet high, with suitable oil room, keepers' dwellings, and outbuildings, will cost on Mount Cornelia \$175,000.

It is recommended that an appropriation of that amount be made therefor.

689. *Cape Canaveral, seacoast of Florida.*—In 1890 Congress appropriated \$80,000 for moving this light-station to a safe site, should continued encroachment of the sea upon the site make such action necessary. Before the appropriation was made, however, wooden works of protection were built with a frontage of 800 feet along the high water of the Atlantic beach. On June 30, 1890, this work had resulted in pushing back the high-water line from the revetment at its north angle, 205 feet; at its middle, opposite the tower, 150 feet, and at its south angle, 173 feet. On June 30, 1891, these distances were, respectively 160, 136, and 176 feet. Between November 23, 1891, and April 30, 1892, these distances had been reduced, at their lowest, to 80, 45, and 82 feet, but by June 30, 1892, the date of the last report from the keeper, the land had gained its losses, and the distances from high-water mark were a little greater than in 1890, viz, 220, 164, and 220 feet. It is probable that a new line of wooden revetment constructed along the present high water line would result in the building out of the front an additional 100 or 200 feet; a small part of the appropriation for the removal of the tower may be devoted to this extension. Meantime a new site has been selected, but no steps for its removal will be taken until further report from the engineer of the sixth light-house district shall show it to be necessary.

719. *Jupiter Inlet, seacoast of Florida.*—A substantial boat landing was built, supported by palmetto piles, and connected with the land by a runway on high trestles 140 feet long. A storehouse was built 12 by 24 feet in plan.

Sixth District.

Post Lights in St. Johns River, Florida.—Nos. 604 to 612, inclusive; 614 to 676, inclusive, and 678 to 686, inclusive, are the post lights in St. Johns River. Unlighted beacon No. 32 was surmounted by a red light, and Hendrick Point post light No. 30 was discontinued as a post light but maintained as a day mark. It was ordered when funds would permit, that unlighted beacon No. 12 be lighted, that a beacon showing a white light be erected off Chaseville about Reddies Point in the lower St. Johns River, and that a white light be placed on a beacon already erected at the entrance of Lake Beresford in the upper St. Johns River. The beacons on this river were painted, repaired, renumbered, and are now in good condition. A fixed red light was established on the southeast point of Batton Island Shoal. These lights were generally well cared for by the keepers. They are indispensable to the proper navigation of the river at night.

Post Lights in Indian River, Florida.—Nos. 690 to 718, inclusive, are the post lights in the Indian River. The service rendered on this river was good. Seven additional beacons were established, three of which are lighted and four unlighted.

During the year quarterly inspection visits were made to the foregoing stations. The services rendered by the keepers was good, and the appearance and condition of the various stations is creditable. Few occasions have arisen in which it was found necessary to reprimand a keeper for carelessness or untidiness.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made:

556. Fort Sumter, S. C.	602. Amelia Island, Fla.
573. Oyster Beds, Ga.	687. St. Augustine, Fla.
598. Little Cumberland Island, Ga.	

LIGHT-VESSELS.

520. *Frying-Pan Shoals Light-Vessel, No. 29, near the end of Frying-Pan Shoals, off Cape Fear, North Carolina.*—The vessel is in fair order and condition and is well kept.

549. *Rattlesnake Shoal Light-Vessel, No. 38, off Charleston, South Carolina.*—This vessel is well kept. She is in poor condition and it will require extensive repairs to put her in good order.

561. *Martins Industry Light-Vessel No. 34, off Port Royal Entrance, South Carolina.*—This vessel is in fair order and condition and is well kept.

DAY OR UNLIGHTED BEACONS.

There are in this district 37 day or unlighted beacons, which are in good condition.

Sixth District.**FOG SIGNALS.**

Three fog-signal bells, operated by clockwork and located at Fort Sumter, Fort Ripley Shoal, Middle Ground, South Carolina, and Volusia Bar, St. Johns River, Florida; all are in good working order and are well attended.

BUOYAGE.

Especial attention was given to buoyage. The buoys were relieved as often as necessary. The old buoys were repaired at a reasonable cost. By this means an ample supply was kept on hand for replacing needed buoys. Few buoys were lost or were reported as adrift. The local pilots employed to keep buoys in their places at the entrance to Winyah Bay, South Carolina; Fernandina, St. Johns River, and St. Augustine, Florida, performed their duties well.

DEPOTS.

Castle Pinckney, Charleston Harbor, South Carolina.—About 1,000 square feet of decking 3 inches thick, with new flooring joists, were laid. A boat shed 15 by 30 feet in plan was built. The light-house structures are in good condition, excepting the wharf, a considerable part of which will within two or three years require renewal of both piles and superstructure. In the present year 20 new fender piles and some 5,000 square feet of new decking will be sufficient.

TENDERS.

The Pharos.—After undergoing a general overhauling, painting, and setting up of standing rigging during July and a part of August, 1891, this schooner was actively employed in repairs, constructions, and surveys. She received a new suit of sails and a new steering gear and is in excellent order. During the latter part of August, 1891, she was engaged in repairing Fort Sumter beacon and dwelling. In September she was employed at Morris Island. In October and November she was making repairs at Castle Pinckney buoy depot and at Paris Island light-station, South Carolina. In December she was building a wharf and tramway at Hunting Island light-station, South Carolina. In January and February she repaired Oak Island and Bull Bay light-stations, building an oil house at each. In March she built a wharf and fence at Cape Romain. In April and May she repaired Hilton Head and Daufuskie Island light-stations, South Carolina, and built an oil house at each place. June was devoted to a general overhauling of ballast, painting, and refitting, but during the month she also removed the front beacon of the Morris Island south and north ranges. The naphtha launch, 25 feet long and of 4 horse power, which in September, 1891, was trans-

Sixth District.

ferred from Hunting Island light-station, South Carolina, to the tender *Pharos*, was of great service. It was used to carry workmen quickly and without labor on their part between the vessel and the light-stations, to tow rafts of lumber and boat loads of other material, as occasion required, and it was used as a mail boat to the *Pharos* when she was working at stations only accessible by water. The total running time of the launch has been 212 hours; the distance run was about 1,500 miles. The cost per mile run, for gasoline at 11½ cents per gallon delivered, was 3.8 cents. Her machinery was worked by one of the crew of the *Pharos*. No expense was incurred on her account for any kind of repairs.

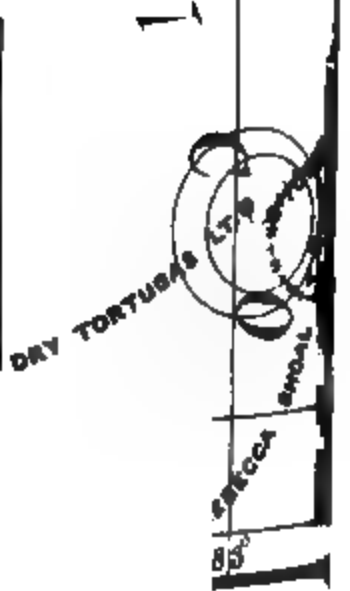
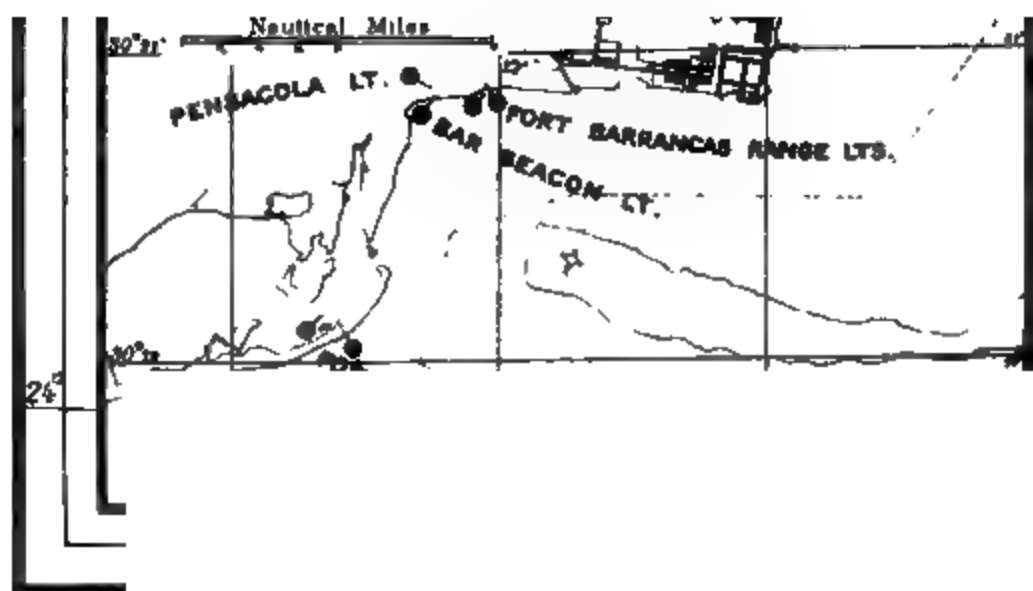
The Wistaria.—This steamer relieved 313 buoys, replaced 7, painted with three coats of paint 378, put soft patches on 17, repaired 116 buoy chains, recovered 8 buoys found adrift, and did 53 days' work at the depot. She also assisted in renumbering and repairing the post lights on the St. Johns River, Florida. She transported the inspector, quarterly, to inspect the light-stations in this district, and supplied the light ships with their allowance of provisions and 30 tons of coal. She steamed some 9,600 miles, with an expenditure of about 555 tons of coal and 12 cords of wood. She was 50 days in motion, 170 days under banked fires, and 145 days without fires under her boilers. Extensive repairs were made on this vessel. A new boiler was put in under contract, and a new hoisting engine and steam steerer were put in. Her engines were overhauled as far as practicable, with the assistance of the force on board, but they will soon need thorough repair. Her galleys frame was repaired and is now in good order. The wheel houses, cabins, buoy deck, and skylights were repaired, and an almost entirely new stern was put in by the force on board. The vessel is now in good condition.

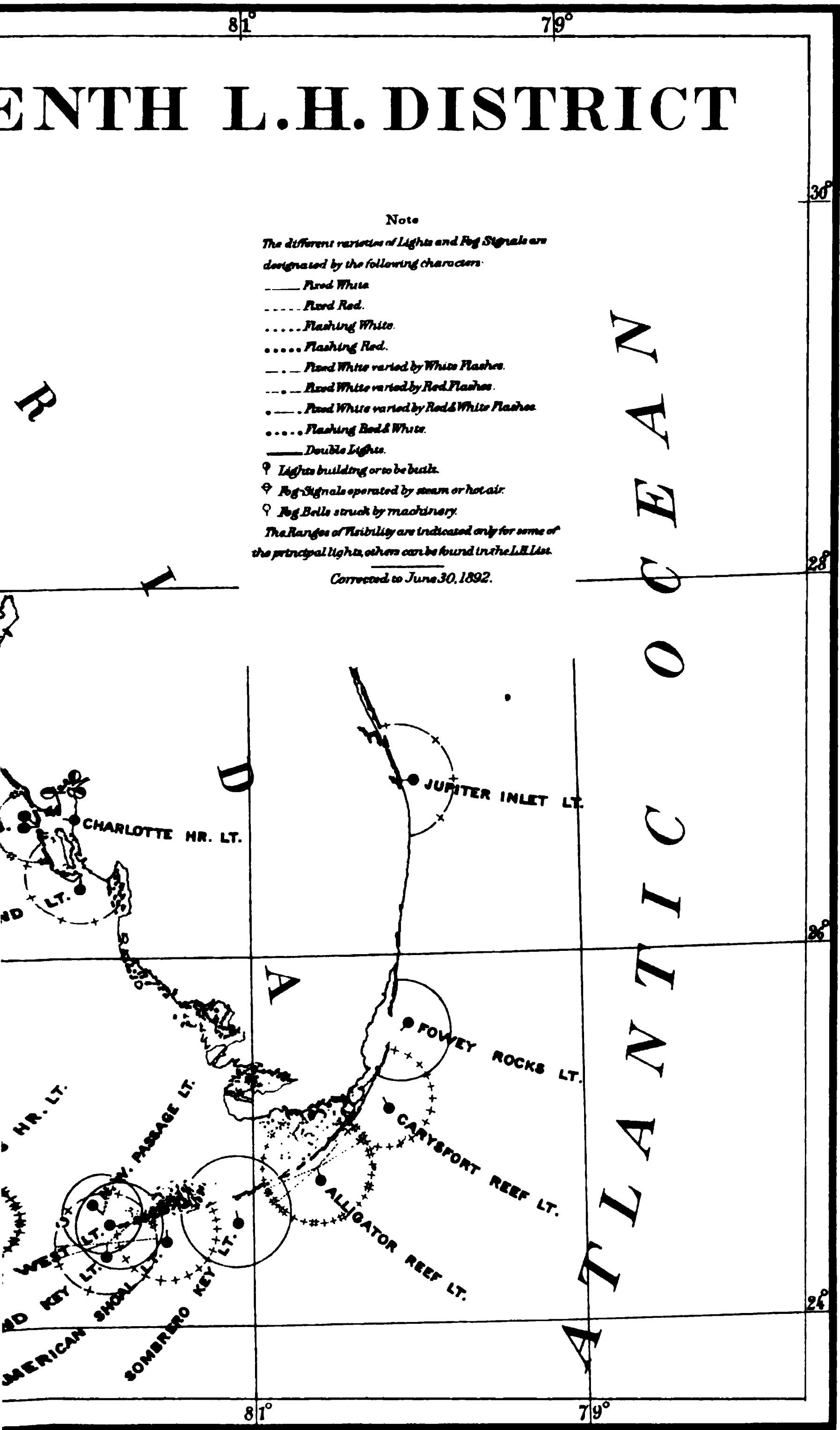
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SEVI





SEVENTH DISTRICT.

The seventh district extends from just south of Jupiter Inlet, Florida, to the mouth of the Perdido River, Florida, and includes all aids to navigation on the Atlantic and Gulf coasts of Florida within these limits.

Inspector.—Commander George R. Durand, U. S. Navy, to May 31, 1892; Commander William B. Newman, U. S. Navy, from May 31, 1892.

Engineer.—Maj. James B. Quinn, Corps of Engineers, U. S. Army.

There are in this district—

Light-houses and lighted beacons	32
Day, or unlighted beacons	37
Whistling buoys in position	3
Bell buoys in position	5
Other buoys in position	237
Steamer <i>Laurel</i> , buoy tender and for supply and inspection	1
Steamer <i>Arbutus</i> , for construction and repair in the seventh and eighth districts.	1
Schooner <i>Clover</i> , for construction and repair in the seventh and eighth districts until December 26, 1891.....	1

LIGHT-HOUSES.

— *Hillsboro Inlet, off Hillsboro Point, between Jupiter Inlet and Fowey Rocks light, Atlantic coast of Florida.*—The following recommendation, which was made in the last seven annual reports of the Board, is renewed, with the recommendation that \$90,000 be appropriated for this purpose:

The establishment of a light at or near Hillsboro Point, Florida, would be of great assistance to all vessels navigating these waters. Steamers bound southward, after making Jupiter Inlet light, hug the reef very closely to avoid the current. The dangerous reef making out from Hillsboro Inlet compels them to give it a wide berth and to go out into the Gulf Stream. Vessels coming across from the Bahama Banks would be able to verify their position if a light were placed here; a difficult matter in case they fail to make Jupiter Inlet. The establishment of this light would complete the system of lights on the Florida reefs. The Board therefore renews the recommendation that \$90,000 be appropriated for this purpose.

720. *Fowey Rocks, Atlantic coast of Florida.*—The positions of the proposed red sectors were laid out. The light-house was scaled and painted. A new boat, a dingy, with sails, etc., complete was supplied.

721. *Carysfort Reef, on Carysfort Reef, near the edge of the Gulf Stream, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out. The inside of the cylinder was ceiled and painted; 15 pairs of new iron doors and one wooden door were put up; a new boat winch was put up; a new platform was built under the keeper's dwelling, and various minor repairs were made. The iron light-house was scaled and painted.

Seventh District.

722. *Alligator Reef, Gulf of Mexico, Florida.*—The red sectors for the illuminating apparatus were fitted, and on September 20, 1891, the characteristics of this light were changed. The positions for the proposed new red sectors were laid out. A new platform was built under the dwelling, and various minor repairs were made. The iron light-house was scaled and painted.

723. *Sombrero Key, on Sombrero Shoal, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out. A new platform was built under the keeper's dwelling; a new iron railing was put up around the lantern gallery and around the keeper's dwelling. Various repairs were made. A new sailboat 18 feet long was supplied. The iron light-house was scaled and painted.

724. *American Shoal, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out. A set of packing rings was furnished for the use of the illuminating apparatus. The iron light-house was scaled and painted.

725. *Sand Key, Gulf of Mexico, Florida.*—The red sectors for the illuminating apparatus were fitted, and on September 30, 1891, the characteristics of this light were changed. The positions for the proposed new red sectors were laid out. New window and door blinds and new galvanized-iron gutters were put up around the keeper's dwelling; a new iron door was hung in the lantern, all new work was painted, and various repairs were made. The iron light-house was scaled and painted. The sailboat was extensively repaired.

726. *Key West, on Key West Island, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out. The tower was whitewashed.

The following recommendation, which was made in the Board's last annual report, is renewed:

The tower is of brick and in good condition. It is, however, not high enough to make it as conspicuous as it should be. Tall trees obstruct the view of the light from the northwest. It is an important light of the third order, and is a leading light for no less than seven different channels in the vicinity. The tower is but 60 feet high. It would be an immense improvement in many ways to build up the tower about 20 feet, to increase the height of the watchroom section about 3 feet, and to provide a suitable balcony.

The watchroom is so low that the keeper can not stand erect in it, and the balcony is too narrow for practical purposes. The changes suggested would require the substitution of a temporary light for about a month, the construction of a new watchroom section with suitable balcony, a new pedestal for the lamp, and an increase in the height of the brickwork of the tower of about 20 feet. It is estimated that the proposed work will cost, including scaffolding and labor, about \$4,500, and recommendation is made that an appropriation of this amount be obtained therefor.*

* An appropriation of \$3,000 to do the work mentioned in the foregoing paragraph was made in the sundry civil appropriation act which was approved on August 5, 1892. The Board estimated the needed work would cost \$4,500. It can not be done for a less amount: It is, therefore, recommended that an additional appropriation of \$1,500 be made for this purpose.

Seventh District.

727. *Northwest Passage, entrance to harbor of Key West, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out, and various minor repairs were made. The iron light-house was scaled and painted.

728. *Rebecca Shoal, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out, and various repairs were made.

730. *Tortugas Harbor, Gulf of Mexico, Florida.*—The positions for the proposed red sectors were laid out.

731. *Sanibel Island, Gulf of Mexico, Florida.*—New foundations and platforms were put up under the cisterns. A new steel-wire fence 680 feet long was put around the two dwellings and tower, and was painted. Various minor repairs were made. The light-house was painted.

733. *Gasparilla Island Beacon, entrance to Charlotte Harbor, Gulf of Mexico, Florida.*—This beacon, which was in the water 50 feet from the beach, was washed out by the shifting of the channel. When the light-house tender visited the place the beacon was taken down and was reërected 175 feet from high-water mark, and 475 feet from the main light, on a range with the outer buoys. The beacon is 22 feet high and is painted black.

734. *Charlotte Harbor, Gulf of Mexico, Florida.*—A new boat winch was put up and was furnished with two leading-blocks.

735. *Mangrove Point Beacon, Charlotte Harbor, Gulf of Mexico, Florida.*—This beacon was run into by a passing vessel and nearly capsized. It has never been lighted. It is in a precarious situation and is liable to be completely destroyed by colliding vessels.

738. *Egmont Key, entrance to Tampa Bay, Gulf of Mexico, Florida.*—A new steel-wire fence 388 feet long was put around the keeper's dwelling and painted. The wash-house was moved nearer to the cistern, and various repairs were made.

It appears that mail steamers as well as others bound to Tampa Bay and for Port Tampa have been delayed by fog. This can be prevented by the establishment of a fog bell to be struck by machinery at Egmont Key light-station. It is estimated that this can be done for not exceeding \$2,000, and it is hoped that the general appropriation for expenses of fog signals to be made for the coming fiscal year may be sufficient to enable the Board to defray the expense therefrom.

— *Tampa Bay, Florida.*—Urgent call not only by the merchant marine but by the Navy has been made upon the Light-House Establishment to increase the number of lights and beacons in Tampa Bay. The Board thereupon directed its local officers to make a thorough examination and careful report of the facts in the case. When their report was received the Board, after due consideration, decided, in view of the fact that Tampa Bay affords the best harbor on the Florida coast, and that 20 feet of water can be carried clear up to the wharves, that the interests of commerce and navigation require certain changes in existing

Seventh District.

aids to navigation in Tampa Bay, and that the following-named aids ought to be provided:

(1) That the outer buoy for the north channel be made a whistling buoy.

(2) That the red buoy No. 2 of the north channel be replaced by a red sleeve-pile day beacon.

(3) That the red buoy No. 2 of the southwest channel be replaced by a red sleeve-pile day beacon.

(4) That the black buoy No. 3 to the eastward of Mullet Key, be replaced by a black sleeve-pile lighted beacon.

(5) That the red beacon No. 6 be replaced by a sleeve-pile beacon showing a red light.

(6) That the red beacon No. 8 be made a sleeve-pile beacon showing a red light.

(7) That a sleeve-pile day beacon, with red and black stripes, be placed on the wreck to the southwestward of Gadsden Point.

(8) That a sleeve-pile day beacon be placed on the 8½-foot shoal off Catfish Point, near the mid-channel buoy, Hillsboro Bay.

(9) That the red buoy No. 6 be made a sleeve-pile beacon showing a red light.

It is estimated that these new aids will cost not to exceed \$6,000, and it is recommended that an appropriation of this amount be made therefor.

Additional aids to navigation in Tampa Bay were urgently needed by its increasing commerce. The Board, therefore, took the rather unusual step of immediately marking the channel by huge numbered day beacons, which the electric search lights, now carried by most steamers, will make as available at night as during the day. This makeshift, it is hoped, will avert serious disaster until appropriation can be made for the erection of the needed and recommended lights.*

739. *Anclote Keys, Gulf of Mexico, Florida.*—The sailboat was repaired.

740. *Cedar Keys, Gulf of Mexico, Florida.*—A new sailboat was supplied, an oil house was built, and the dwelling was extensively repaired.

741. *St. Marks, entrance to St. Marks River, Gulf of Mexico, Florida.*—A steel-wire fence, 453 feet long, was built around the tower and keepers' dwelling, and was painted.

742. *Crooked River, Gulf of Mexico, Florida.*—On July 31, 1888, \$40,000 was appropriated for the erection of a light-house on the mainland to the westward of Crooked River, in Franklin County, Fla. The

* Congress appropriated \$6,000 in the act entitled "An act for the establishment of additional aids to navigation in Tampa Bay, Florida," which was approved on July 27, 1892. The proper measures have been taken to have the aids to navigation named in the foregoing paragraphs established as soon as practicable.

Seventh District.

land for the site was selected and a deed of some 12 acres, with a tracing showing the location, with an abstract of title, was sent on September 19, 1889, to the proper United States attorney for examination. The deed was found insufficient and condemnation proceedings were instituted. In July, 1891, the United States court-house was destroyed by fire and all the papers in the case were burned. Measures were taken at once to duplicate the papers.*

744. *Apalachicola Bay front beacon, Gulf of Mexico, Florida.*—This beacon was destroyed on November 23, 1891, in a collision, by the tug *Constance*. It was rebuilt on the same site, and two clusters of piles were placed, by contract, around the beacon for its protection.

745. *Apalachicola Bay rear beacon, Gulf of Mexico, Florida.*—This beacon was repaired and painted by contract during the year.

746. *Cape San Blas, Gulf of Mexico, Florida.*—The station is in danger from the encroachment of the sea. Negotiations are being made for a new location. Slight repairs were made.

— *St. Joseph Point, St. Joseph Bay, Gulf coast of Florida.*—The following recommendation, which was made in the Board's annual reports for the last four years, is renewed:

The fishing fleet on this coast is large. A southerly gale is calculated to drive these vessels upon a lee shore. The only harbor of refuge for some 60 miles is St. Joseph Bay. This is easily accessible in the daytime, but at night it is difficult of entrance without a light. The Board is decidedly of opinion that it would be largely to the interests of the fishing fleet in particular, and the commerce and navigation of the Florida coast in general, that this light should be established. It is estimated that it can be done for \$25,000. A bill for this purpose was favorably reported upon recently by the Senate Committee on Commerce, and the Senate inserted the item in the sundry civil appropriation bill, but as it failed of enactment the recommendation is renewed.

747. *Pensacola, Pensacola Bay, Gulf of Mexico, Florida.*—A first-order oil house was built, and various minor repairs were made.

751. *Fort Barrancas front range, Pensacola Bay, Gulf of Mexico, Florida.*—Some 18 brick pillars were put under the dwelling and kitchen. A new foundation was put under the cistern and 300 feet of wire fence were put up.

— *Deer Point, entrance to Santa Rosa Sound, Pensacola Bay, Florida.*—A small, inexpensive beacon light is needed on Deer Point, near the quarantine ground at the entrance to Santa Rosa Sound, Pensacola Bay, Florida. It is estimated that it can be established for not exceeding \$1,000, and it is recommended that an appropriation of this amount be made therefor.

* The title to the site was approved by the Attorney-General of the United States on August 22, 1892.

Seventh District.**REPAIRS.**

At each of the following-named stations repairs, more or less extensive, were made during the year:

721. Carysfort Reef, Fla.
 722. Alligator Reef, Fla.
 723. Sombrero Key, Fla.
 725. Sand Key, Fla.
 727. Northwest Passage, Fla.
 728. Rebecca Shoal, Fla.
 729. Dry Tortugas, Fla.
 731. Sanibel Island, Fla.

738. Egmont Key, Fla.
 739. Anclote Keys, Fla.
 740. Cedar Keys, Fla.
 743. Cape St. George, Fla.
 745. Apalachicola Bay, Fla.
 746. Cape San Blas, Fla.
 747. Pensacola, Fla.

DAY OR UNLIGHTED BEACONS.

Beacons were built in Tampa Bay by the tender *Putnam* and a hired pile-driver at the following-named places:

A three-pile wooden beacon, black, No. 5, on the south end of the middle ground.

A three-pile wooden beacon, red, No. 6, at the south end of South Cut.

A two-pile wooden beacon, red, No. 10, at the south end of North Cut.

A two-pile wooden beacon, red, No. 12, at the northerly end of North Cut.

Live Oak Point Beacon, Charlotte Harbor, was broken off by collision with a phosphate barge.

The Sea-Horse Reef Beacon, black, at Cedar Keys, Florida, was destroyed by collision with the tender *Putnam*. It was not rebuilt, as it was no longer needed.

BUOYAGE.

The buoys were changed during the year so far as it was practicable to do so. The following-named new buoys were placed:

Two buoys to mark the Narrows in Tampa Bay.

A second-class whistling buoy at the entrance to North Channel, Tampa Bay.

One buoy to mark Molasses Reef, Florida Reefs.

One buoy on western edge of St. Martins Outer Shoal, Gulf of Mexico.

One buoy to mark Ten-Foot Shoal in Northwest Channel, Key West Harbor.

One buoy to mark Key Biscayne Shoal, Straits of Florida.

One buoy to mark the westerly edge of Fort Taylor Shoal, Key West Harbor.

The following-named buoys were discontinued as no longer necessary:

Starboard Reef buoy, Turtle Harbor.

North Point of Middle Ground buoy, Turtle Harbor.

Two-Foot Shoal buoy, Turtle Harbor.

Seventh District.

West Point of Middle Ground buoy, Turtle Harbor.

Only two buoys went adrift, but as there are two buoys on the beach near Phillips Inlet that can be recovered by the tender there will probably be no loss.

DEPOTS.

Tortugas, Fort Jefferson, Florida.—The piles standing in the water are nearly eaten off by the shipworm. The shed and blacksmith shop are in good condition. No repairs were made during the year.

Egmont Key, Florida.—The outer end of the wharf needs rebuilding. The cistern should be replaced and a new cistern added, with pipes leading from both to the outer end of the wharf, for watering the tenders. No repairs were made during the year.

Key West buoy depot and coal shed, Florida.—The coal shed has settled about 5 feet. It should be raised to the level of the wharf and have new piles driven under it for its support. The wharf needs new planking, and most of the stringers and piles need replacing. A new cistern, with connecting pipes to the end of the wharf, are needed.

Pensacola, Florida.—It is in good condition, but has no wharf. The Navy wharf has recently been repaired and its use loaned to the Light-House Establishment.

TENDERS.

The Putnam.—This steamer was constantly employed until relieved by the *Laurel* on September 28, 1891. She changed 8 buoys, landed 2 cords of fuel and 32 rations at stations, made 22 inspection trips, and her crew worked some 10 days at the depots. She scaled and painted five iron-pile light-houses, which occupied some 24 days. She was under steam 51 days, and fires were hauled 30 days. In doing this she steamed about 1,697 nautical miles and consumed about 112 tons of coal. This tender was towed by the *Laurel* from Key West to Pensacola in November, and thence to Milton, Fla., where she is laid up with a watchman in charge. Her condition is fair, but her boiler is so thoroughly incrustated with scale as to render the time necessary to put it in condition for use quite uncertain.

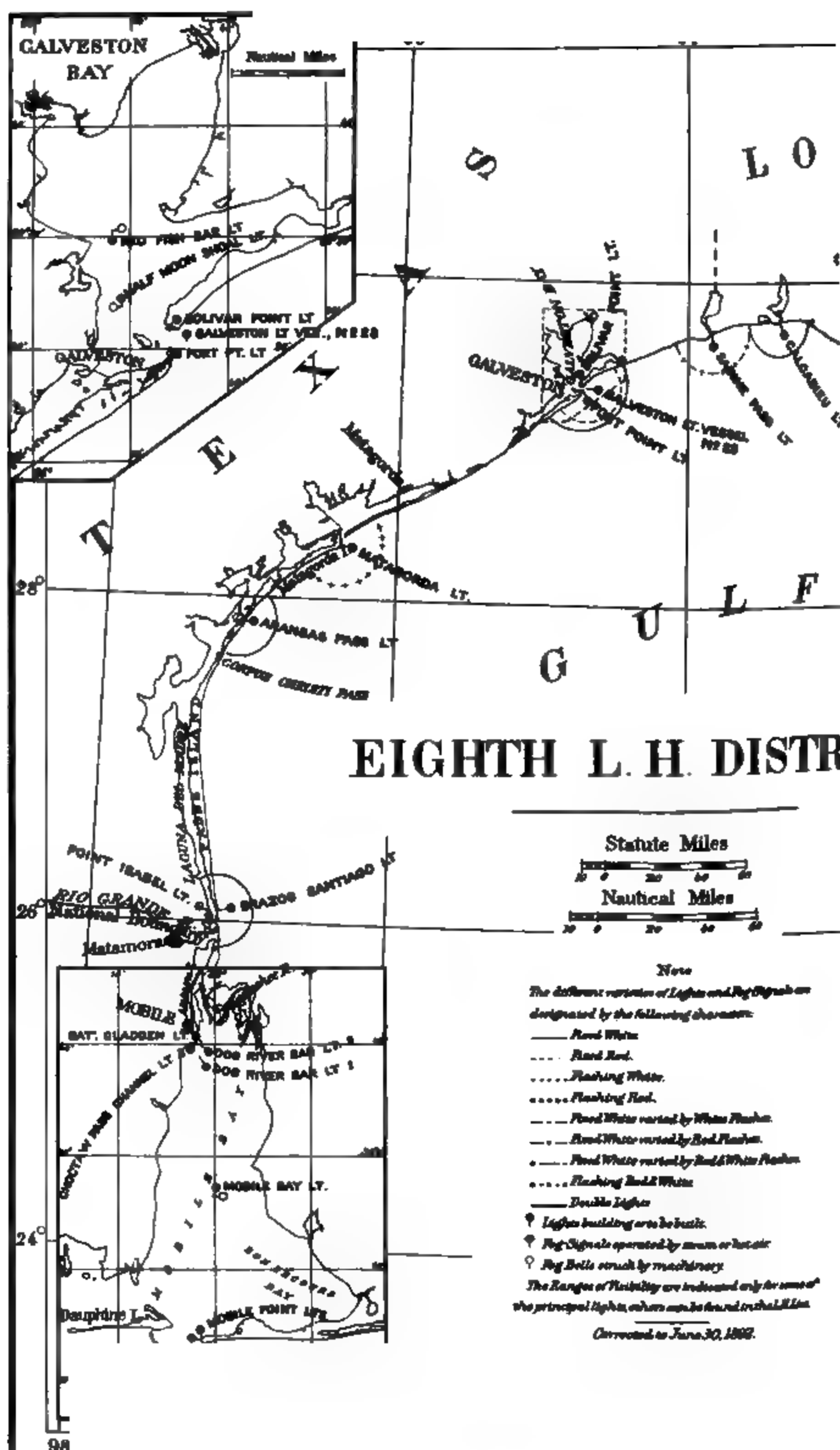
The Laurel.—This steamer, after having been repaired at the North, relieved the *Putnam* September 28, 1891, and has since been constantly employed at the regular inspection, supply, and buoy work of the district. She scaled and painted 4 light-houses in about 28 days, cleaned 150 buoys and painted them three coats each, changed 110 buoys, landed 25 cords of fuel and 35 rations at light-stations, made 28 inspection trips, and her crew worked 75 days at the different depots. The engineers bushed 67 and patched 12 buoys. She was under steam 156 days, and fires were hauled 91 days. In doing this work she steamed 5,866 nautical miles and consumed 380 tons of bituminous

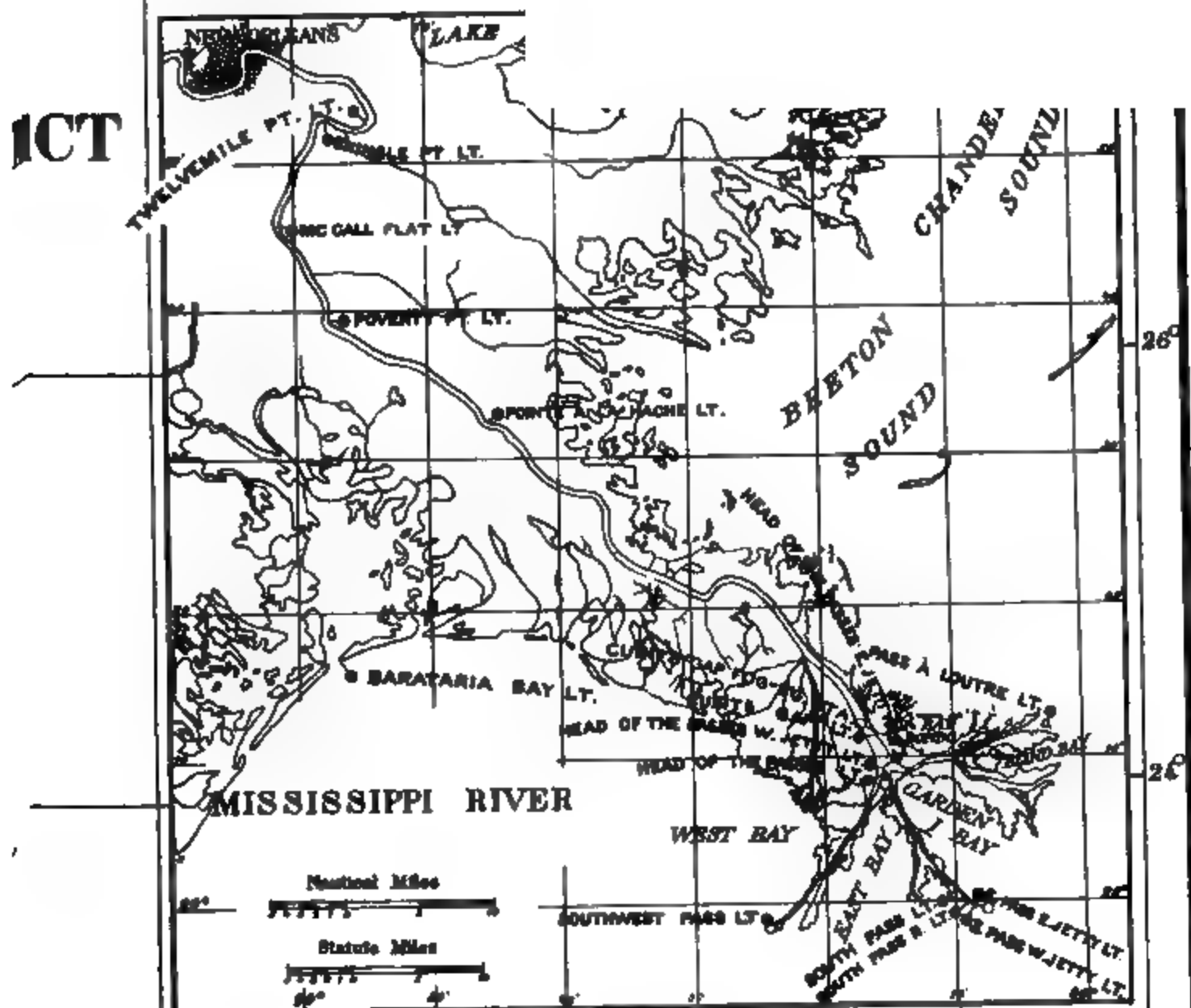
Seventh District.

coal. The tender's large whaleboat was wrecked at Rebecca Shoal in January and a new one is being built. The second whaleboat is un-serviceable. The dingy is in good condition, but all the boats need new sails. The tender is in good working condition. The starboard engine was disabled by a broken crank pin June 3, 1892, while on a trip to Gasparilla Island. Under the port engine she is able to make 6 to 7 knots, according to the weather. She has made six inspection trips and one special trip to Gasparilla; has changed 29 buoys, and her crew has worked 9 days at the depots. She was under steam 29 days and fires were hauled 1 day. In the performance of the above work she steamed 888 nautical miles and consumed 49½ tons of coal.

The Arbutus.—This steamer was actively employed in making repairs to the light-houses in the seventh and eighth districts. She was docked and her old metal was patched. Some calking was done and other minor repairs were made. The machinery was put in good order. The propeller shafts were straightened, new shaft bearings were put in place of those worn out, and the wheels, where bent, were brought into shape. The boiler is not at all satisfactory. It has been repaired several times, as its material is defective. A new boiler will have to be supplied soon. During the year she ran 14,044 miles and consumed 717 tons of coal.

The Clover.—This schooner was actively employed in making repairs to light-stations in the seventh district until December 26, 1891, when she was transferred to the fourth light-house district.





EIGHTH DISTRICT.

The eighth district extends from the mouth of the Perdido River, the boundary between Florida and Alabama, to the Rio Grande, the southwestern boundary of Texas, and includes all aids to navigation on the Gulf coast of the United States within these limits, together with those in Lakes Borgne, Pontchartrain, Maurepas, Grand Lake, and Lake Chicot, and those on the Mississippi River below New Orleans, La.

Inspector.—Commander Dennis W. Mullan, U. S. Navy.

Engineer.—Maj. James B. Quinn, Corps of Engineers, U. S. Army.

In this district there are—

Light-houses and beacon lights (including twelve post lights on the Mississippi River, Grand Lake, and Lake Chicot)	62
Light-ships in position	2
Day or unlighted beacons	17
Fog signal operated by steam	1
Fog signals operated by clockwork.	11
Whistling buoys in position	3
Bell buoys in position	1
Other buoys in position	95
Steamer <i>Panay</i> , buoy tender and for supply and inspection	1
Steamer <i>Arbutus</i> , for construction and repair in the Seventh and Eighth districts.	1
Schooner <i>Clover</i> , for construction and repair in the Seventh and Eighth districts until December 26, 1891	1

LIGHT-HOUSES.

— *Dog River Bar, Mobile Bay, Alabama.*—The following recommendation, which was made in the Board's annual reports for the last four years, is renewed:

The present system of lights is not sufficient to enable vessels to run up to Mobile at night. The Board therefore renews its recommendation of last year, that a screw-pile structure be established carrying a fourth-order flashing light at about where the upper channel beacon now stands, near the second bend in the dredged channel. For this purpose an appropriation of \$20,000 should be made.

— *The Ship Channel, Mobile Bay, Alabama.*—The following recommendation, which was made in the Board's annual report for the last two years, is renewed:

The interests of commerce require that additional aids to navigation be established along this channel. The Board is of opinion that five or more light-stations should be built along the ship channel. It is estimated that these lights can be established for \$60,000, and it is recommended that an appropriation of this amount be made therefor.

756. *Sand Island, Gulf of Mexico, near Mobile Point, Alabama.*—A first-order oil house was erected. The encroachments of the sea are

Eighth District.

disturbing the keeper's dwelling; the foundations are commencing to give way, and it will soon be necessary to move the dwelling. A new 26-foot cat-rigged sailboat was furnished.

764. *Battery Gladden (also Dog River Bar Range, rear), on ruins of Battery Gladden, below the mouth of the Mobile River, Alabama.*—A second-order oil house was erected. A new wharf, 150 feet long, and extending out to about 5 feet of water, was built on cypress piles. Minor repairs were made.

765. *Horn Island, Gulf of Mexico, Mississippi.*—A second-order oil house was built. Minor repairs were made.

769. *East Pascagoula River, mouth of East Pascagoula River, Mississippi.*—Some 76 tons of rock were placed in front of the station to protect the site. Various minor repairs were made.

770. *Ship Island, near the end of Ship Island, Mississippi.*—A second-order oil house was erected. Various minor repairs were made.

771. *Biloxi, entrance to Biloxi Bay, Mississippi.*—A second-order oil house was built. A wire fence was put up around the tower and keeper's dwelling.

773. *Merrill Shell Bank, between Cat Island, St. Joseph Island, and Grand Island, Mississippi.*—The iron ladder from the water to the first landing was renewed with one taken from South Pass depot. The old gutters were renewed with galvanized iron gutters and pipe. Various repairs were made.

790. *Southwest Pass, Mississippi River, Louisiana.*—A 3,000-gallon cistern was put up.

791. *Head of the Passes, Mississippi River, on Deer Island, Louisiana.*—A 3,000-gallon cistern was furnished. Various minor repairs were made.

792. *Head of the Passes West Jetty, upper entrance to South Pass, Mississippi River, Louisiana.*—This beacon was run into and damaged on December 18, 1891, by the Cromwell Line steamer *Seneca*, and on February 6, 1892, it was completely demolished by the steamer *New Orleans*, of the same line. A light will be shown here from a lantern hung on a pole until the beacon is rebuilt. The beacon was built at the extreme outer end of the jetty in an exposed position. The tower was not sufficiently protected, as the piling proved to be not firm enough. The current of the river is swift and the length of the piles is such as to give spring under the pressure of a heavy ship. Also the water was too deep. It is proposed to rebuild the tower in 8 feet of water in the rear of the jetty for the sake of its protection. It is estimated that this can be done for not exceeding \$4,000, and it is hoped that the general appropriation for repairs of light-houses for the coming fiscal year will be sufficient to enable the Board to defray the expense of rebuilding this beacon therefrom.

Eighth District.

793. *Head of the Pâsses East Jetty, entrance to South Pass, Mississippi River, Louisiana.*—This beacon washed out, but it was immediately restored, and without change in location or character. As it is in a situation subject to scour, it must be rebuilt in a more substantial manner. The beacon is now in good condition.

803. *Ship Shoal, Gulf of Mexico, Louisiana.*—Two broken beams under the piazza floor were repaired and three plates were replaced. Extra crane davits were put up on the east side. Various minor repairs were made.

— *Mermenteau River Light-Station, near the mouth of the Mermenteau River, Gulf of Mexico, Louisiana.*—A small inexpensive light established here would be of great benefit to vessels trading between Mermenteau and Galveston. It is estimated that it could be established for not exceeding \$7,000, and it is recommended that an appropriation of this amount be made therefor.

813. *Sabine Pass, on Brant Point, entrance to Sabine River, Louisiana.*—A second-order oil house was put up. Various minor repairs were made. A new 14-foot sailboat was supplied.

815. *Bolivar Point, entrance to Galveston Bay, Texas.*—A first-order oil house was built.

817. *Halfmoon Shoal, Galveston Bay, Texas.*—The lower section of the iron braces was renewed. A new column was put in under the keeper's dwelling. The platform and ladder under the dwelling were repaired. All new work was painted.

• 818. *Red Fish Bar, Galveston Bay, Texas.*—A gallery was put up around the keeper's dwelling. A new tin roof was put on. Various minor repairs were made.

822. *Point Isabel, entrance to Brazos Santiago, Gulf of Mexico, Texas.*—There is an appropriation of \$8,000 for reëstablishing the light at this place. The United States attorney is still engaged in securing title to the land upon which the light-house stands.

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

760. Mobile Bay, Ala.
766. Round Island, Miss.
781. Chefuncte River, La.
784. Chandeleur, La.

785. Pass à Loutre, La.
804. Southwest Reef, La.
816. Fort Point, Tex.

LIGHT-SHIPS.

811. *Trinity Shoal Light-Vessel, No. 43, Gulf of Mexico, Louisiana.*—Early in the year a 20-inch wooden windlass was put in, and at the same time 74 new boiler tubes, 2½ inches in diameter by 78 inches long, and a new check valve for the inspirator of the fog-signal engine were

Eighth District.

furnished. This work was done while the ship was on her station. In May, 1892, the tender *Pansy* towed her to New Orleans, La., where she received a new rudder, new bitt and braces, repairs to rail and riding chock, two new partners, slight repairs to the deck on the forecastle, and copper and rocker keel. The strainers and strainer plates were taken out and thoroughly cleaned. They were found to contain oysters which would surely have prevented the strainers from serving their purpose had they not been removed. Slight repairs were made to the fog signal. While the ship was in dock a survey of her bottom was made and it was found to be in excellent condition. The only place that showed signs of deterioration was on the rocker or bilge keels, where it looked as though she had fouled something and injured both the metal and wood. This was remedied by patching with pine and metal. Before she is returned to her station in July, the vessel will be supplied with fuel for the steam fog signal. Some new mooring chain, recently received from the general light-house depot, will also be put on board. The station was marked by a first-class can buoy in the absence of the light-ship.

814. *Galveston Light-Vessel, No. 28, Galveston Bay, Gulf of Mexico, Texas.*—On March 25, 1892, this vessel was brought in for repairs and a first-class can buoy was moored in her place. She was hauled out on the ways at Galveston, Tex., and a new forefoot, and a new false keel were put on. The yellow metal was replaced where needed. A new stem was affixed, two new planks were put in on her side. New main deck and forward awnings, new windsail and a new jib were recently supplied.

DAY OR UNLIGHTED BEACONS.

The beacons are in good condition.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

811. *Trinity Shoal Light-Vessel, No. 43, Gulf of Mexico, Louisiana.*—This 12-inch steam whistle was in operation 116½ hours and consumed 4¼ tons of anthracite coal.

BUOYAGE.

The buoyage of the district was well cared for. The buoys were all attended to, except a few in the western part of the district, which were not reached by the tender. Eight new buoys were placed, and eight buoys which had drifted out of position were recovered from different localities. The spare buoys at the depot were kept in good order. In December, 1891, and January, 1892, a quantity of buoys, buoy whistles, buoy shackles, ballast balls, stone sinkers, mushroom anchors, and chain were received from the general light-house depot.

Eighth District.

Much chain was used for buoy purposes. During the year 570 fathoms of various sizes were received. Some chain was received for light-vessels also.

DEPOTS.

Port Eads, Louisiana.—The coal shed is in fair condition. The following repairs were made to the buoy shed and wharf: One row of piles was driven in front of the buoy shed to detach the wharf from the shed. A third of the foundation timbers and sills and two-thirds of the side of the building were repaired and renewed. About one-half of the flooring was renewed. A new partition was put up between the buoy shed and the storeroom. The windows were repaired. An office was built, new lockers made in the storeroom, and the buoy shed was lined inside with 1-inch boards. The wharf and planking were repaired where needed. A new fender and hitching piles were driven and the entire buoy shed was painted. New foundations were built for five cisterns and one old and four new cisterns were put up.

TENDERS.

The Arbutus.—This steamer was actively employed during the year in making repairs to the light-houses in the seventh and eighth districts. During the year the tender was docked and the old metal was patched where required. Calking was done where necessary, and other minor repairs were made. The machinery was also repaired and put in good order. The propeller shafts were straightened, new shaft bearings were put in, and the wheels were brought into shape where bent. The boiler is not satisfactory; it was repaired several times; the material appears to be defective. A new boiler will have to be put in before long.

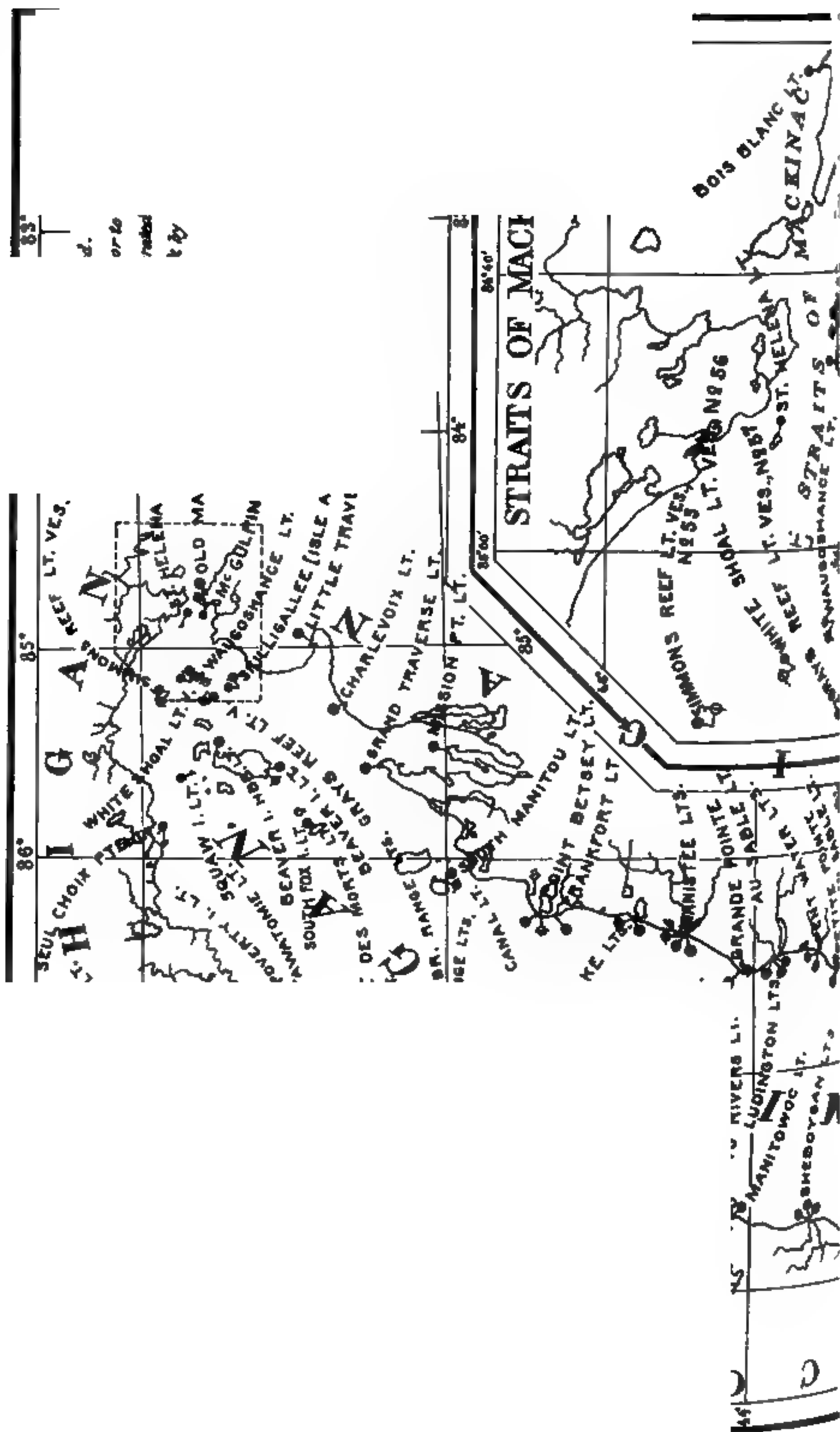
During the year she ran 14,044 miles and consumed 717 tons of coal.

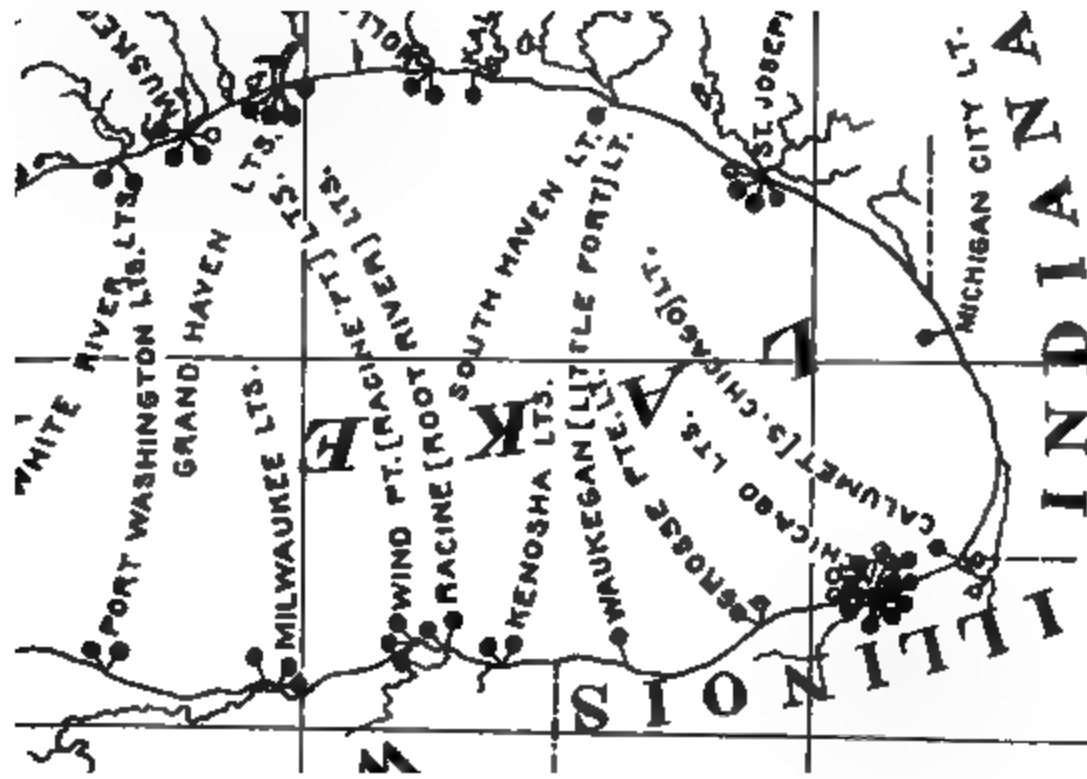
The Clover.—This schooner was actively employed in making repairs to light-stations in the seventh district until December 26, 1891, when she was transferred to the fourth light-house district.

The Pansy.—This steamer was employed in attending to buoyage, supplying light-vessels and stations with rations, fuel, and sundry supplies, and conveying the inspector on the quarterly visits of inspection to the vessels and stations in the district. She placed 10 buoys, recovered 8, and cleaned and painted 150. A few days were devoted to overhauling and removing the buoys, etc., from the depot at Port Eads to facilitate the progress of the repairs being made by the engineer of the district. She carried the boiler-makers out to the Trinity Shoal light-vessel, and waited until they had put in the new tubes and then brought them back to New Orleans. She towed both the Galveston light-ship and the Trinity Shoal light-ship from their respective sta-

Eighth District.

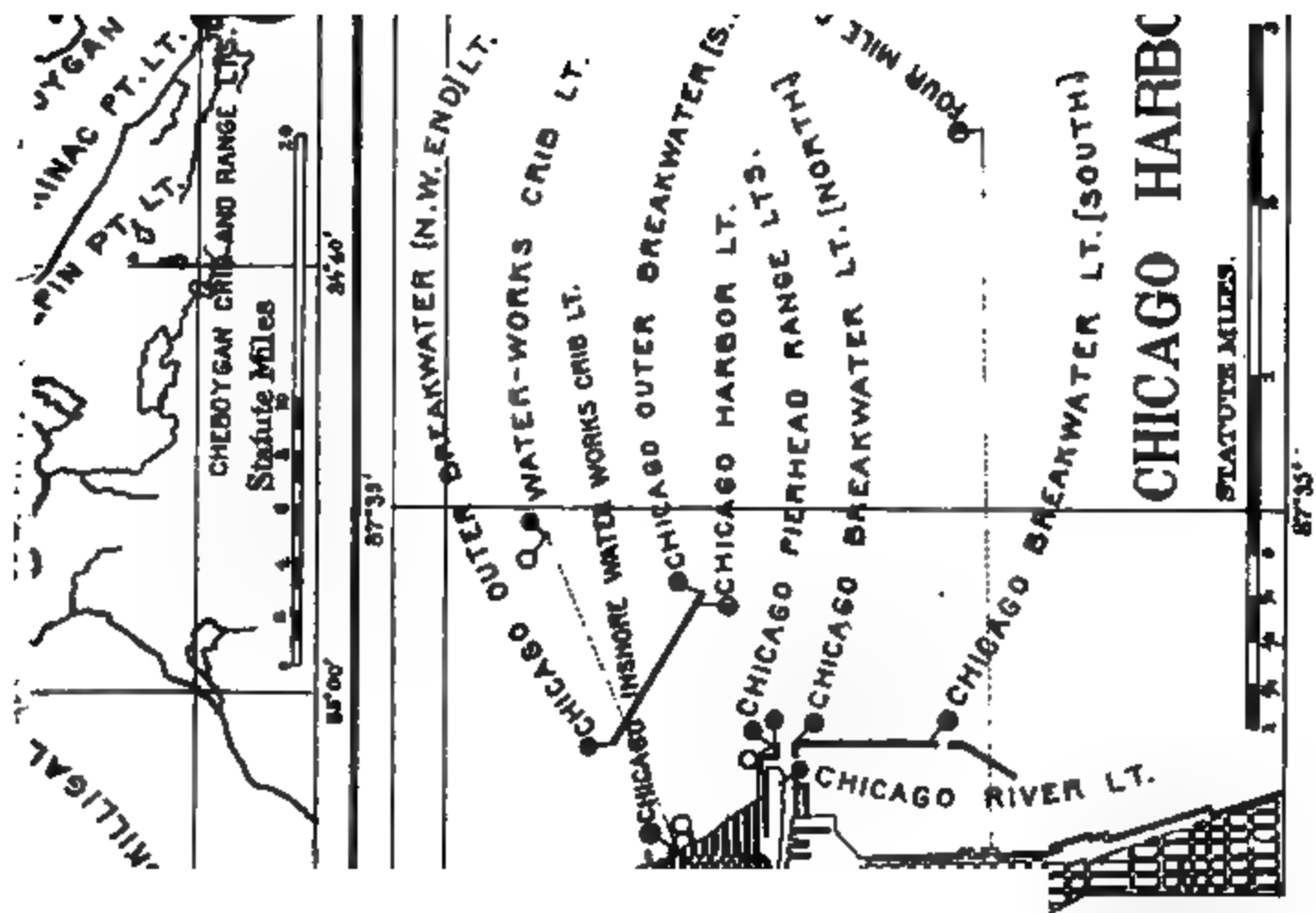
tions to be repaired, and replaced them on their stations. Buoys and buoy appendages were received from the general light-house depot, and the tender brought them from New Orleans to the district depot, where they were stored, and the heavy weights were distributed to the best advantage. The tender was laid up at New Orleans 60 days during the year, where extensive repairs were made to her boiler. She was also docked, her bottom was scraped, and she received two coats of coal tar below the water line. The hull was painted above the water line. She steamed 8,360 miles and consumed about 530 tons of coal.





NTH L. H. DISTRICT.

Corrected to June 30, 1892.



CHICAGO HARBO

STATUTE MILES.



NINTH DISTRICT.

The ninth district includes all aids to navigation on Lake Michigan, Green Bay, and tributary waters, and the Straits of Mackinac, west of a line drawn across the straits from Old Mackinac Point.

Inspector.—Commander Nicoll Ludlow, U. S. Navy.

Engineer.—Maj. William Ludlow, Corps of Engineers, U. S. Army, to June 22, 1892; Col. Orlando M. Poe, Corps of Engineers, U. S. Army, from June 22, 1892.

There are in this district—

Light-houses and beacon lights	91
Light-ships in position	3
Fog signals operated by steam	15
Fog signals operated by clockwork	6
Buoys in position	80
Steamer <i>Dahlia</i> , buoy tender and for supply and inspection	1
Steamer <i>Amaranth</i> , engineer's tender, for repairs and construction	1
Steamer <i>Warrington</i> , engineer's tender, for repairs and construction	1

The lights are classified as follows:

Second-order lights	1
Third-order lights	7
Three-and-a-half-order lights	3
Fourth-order lights	31
Fifth-order lights	12
Sixth-order lights	21
Lens-lantern lights	5
Tubular-lantern lights	11
Total	91

LIGHT-HOUSES.

1178. *Old Mackinac Point, Straits of Mackinac, Michigan.*—Congress, by the act approved on March 2, 1889, authorized the establishment of a light-house at Old Mackinac Point, and by the act approved March 3, 1891, appropriated \$20,000 therefor. An appropriation of \$5,500 was also made by the act approved on March 2, 1889, for the establishment there of a fog signal. The land for the site was purchased and the deed was recorded in June 1890. Work was begun on the fog signal on July 1; it was finished by October 9, and went into operation on November 5, 1890. The plans and general description, with estimate of cost of a light-house and keepers' dwellings, were then made. Bids were asked by advertisement for the metal work and for the construction of the tower and dwellings. Contract was made on October 10, 1891, for the construction of the metal work, which was completed and delivered

Ninth District.

on January 17, 1892, at the light-house depot in Detroit. No bids for the erection of the tower and dwellings were received, so the work was readvertised. On March 19, 1892, six bids were received for furnishing the material and labor necessary to construct the light-house and keepers' dwellings, and was contracted for with the lowest bidder. A contract for the construction of the metal work of a circular iron oil house was made with the lowest bidder after due advertisement, and the work was delivered at the Detroit light-house depot. The erection of the light-house and keepers' dwellings was begun in the latter part of May, and was continued to the end of the fiscal year. A barn was also erected. Slight repairs were made to the fog-signal machinery. The station consists of the light-house tower and keepers' dwellings, the fog signal, the outbuilding or barn, and the oil house. The tower is a cylindrical brick shaft on a base of limestone ashlar. It is 13 feet 4 inches in diameter outside, 45 feet high to the gallery, and 50 feet to the focal plane. It is built of buff-colored brick, and is surmounted by a circular iron gallery and an octagonal fourth-order lantern. The walls are constructed with air spaces, and the interior contains a circular iron staircase and a watchroom 8 feet 8 inches diameter at the top. The tower is connected with and forms the northwest corner of the keepers' dwellings, from which it is separated by a service room, leaving an external entrance and porch. The dwelling, a two-story structure, is arranged as two separate houses under one roof. A lobby measuring 4 feet by 6 feet, adjoining the service room, gives access to both dwellings. The east dwelling contains a parlor, a dining room and a sitting room and kitchen on the first floor. The west dwelling contains a spare room, a living room, and a kitchen on the first floor, and each is provided with pantries and vestibules. Each has three bedrooms in the second story. The finish throughout is white pine, varnished, except the floors of the first story and the staircase and wainscoting, which are of hard wood. Each dwelling has a cistern in the cellar, and there is a good well in the rear, with a pump near the kitchen door of each house. The exterior of the building, as in the case of the tower, is of buff brick with base of ashlar and trimmings of Indiana limestone. The roofs are tin tiling, painted bright red.

The fog signal is just to the eastward of the dwellings and consists of a frame structure 22 by 40 feet in plan, covered with corrugated iron outside and smooth iron inside, and contains duplicate boilers and machinery, and 10-inch steam whistles.

About 54 feet south and to the rear of the dwelling there is a framed one and one-half story outbuilding 16 by 24 feet in plan, covered with boards and battens. The upper portion is shingled and the roof is covered with asphaltic slag.

The oil house, situated in the southeast corner of the light-house site,

Ninth District.

about 150 feet from the tower, is a circular iron structure capable of storing 360 gallons of mineral oil at a time, in 5-gallon cans.

The land on which the light-station at Old Mackinac Point stands consists of three lots, each measuring 50 by 170 feet, making in all a site measuring 150 by 170 feet, facing north towards the Straits of Mackinac. A road 40 feet wide runs in front of the reservation. The Government owns the beach on the north side of the road. At the northeast angle of the property the road runs about southeast and northwest, cutting the two adjoining and unoccupied lots on that side at an angle. The steam fog-signal house stands in the northeast corner, its front $7\frac{1}{2}$ feet from the north line and its east side $7\frac{1}{2}$ feet from the present east line. The dwelling, with the light tower at its northwest corner, has its front nearly on a line with the south end of the fog-signal house and is but 19 feet from it to the west. The western side of the tower is but 23 feet from the west line of the property. A barn is behind the dwelling and a storehouse is behind the signal house. There is little room for the storing of wood on the property, and wood is the cheapest and best fuel that can be obtained.

The fog-signal house is too near the dwelling and should be moved 50 feet. The established grade will require the raising of the signal house to conform to the grounds about the dwelling. It is desirable that the signal house should be moved to a safe and convenient distance from the dwelling, and space given for storage and fuel. It is therefore recommended that the lots on the east side of the light-house property be acquired. It is estimated that this can be done for not exceeding \$1,000, and it is recommended that an appropriation of this amount be made therefor.*

1186. Beaver Island Harbor, Lake Michigan, Michigan.—The material required for fencing the light-house grounds was delivered at the station by the tender *Warrington*. Some 400 running feet of sidewalks around the dwelling were renewed, and the platform at the barn was rebuilt. Some 800 running feet of fence were built around the station buildings and provided with four gates.

1187. Beaver Island, Lake Michigan, Michigan.—The materials required for the construction of a barn and for making repairs to the dwelling were delivered at the station by the tender *Warrington*. A barn was built. It is 16 by 20 feet in plan, 14 feet high to the eaves, with a roof of one-half pitch. Various repairs were made.

1190. South Fox Island, Lake Michigan, Michigan.—The materials for building some 600 running feet of sidewalk, 2 feet wide, were delivered at the station by the tender *Warrington*. The work was done by the keeper. The revolving apparatus was shipped to Detroit light-house depot, where it was put in good repair, when it was returned to the sta-

* This station was lighted for the first time on the night of October 25, 1892.

Ninth District.

tion. The following recommendation, which was made in the Board's last two annual reports, is renewed:

The passage between South Fox and Manitou islands is much used by vessels, which, because of the outlying shoals south of the Fox, either keep near the South Fox Island light or off the north end of Manitou. It is therefore recommended that a steam fog signal be established at South Fox Island light-station, Lake Michigan, at a cost not exceeding \$5,500, and that an appropriation of that amount be made therefor.

— *North Manitou Island, at the north end of Manitou Island, Lake Michigan, Michigan.*—The immense commerce between the Straits of Mackinac and Green Bay uses three different passages:

(1) The north passage, which is protected by the lights at White Shoal, Squaw Island, and Seul Choix Pointe.

(2) The passage between North Fox Island and Beaver Island.

(3) The passage between North Manitou and South Fox islands.

The choice between these channels depends entirely upon the conditions of the weather prevailing at the time. In view of the immense trade, each passage needs to be well lighted. A light on the north end of North Manitou Island is needed for the protection of the third passage above named. There is a large traffic through the passage north of North Manitou Island, which is unmarked, except by the Fox Island light, 17 miles distant. A light and fog signal on the north end of North Manitou will be a valuable aid to navigation. It is estimated that they can be established at a cost not to exceed \$20,000, and it is recommended that an appropriation of this amount be made for that purpose.

1193. *South Manitou, Lake Michigan, Michigan.*—A circular iron oil house and the material for its erection were delivered at the station by the tender *Warrington*. Various repairs were made. A small landing crib was built by the keeper of logs picked up on the beach.

1194. *Point Betsey, Lake Michigan, Michigan.*—The construction by contract of the duplicate fog-signal boilers and machinery was completed, and the machinery was delivered at the station. A frame fog-signal house, measuring 22 by 40 feet, with corrugated iron siding and roofing and smooth iron lining, was built some 120 feet north of the light-house tower upon a substantial brick foundation. A brick-curbed well was provided. The fog-signal machinery was erected and tested on December 22, 1891. The signals were put in operation for the first time on December 31, 1891. The light at this station was, on April 23, 1892, changed from fixed white varied by a white flash every ninety seconds to flashing white every ten seconds. A circular iron oil house of 360 gallons' capacity was built on a concrete foundation. A concrete floor was laid in the cellar of the dwelling. Some 530 running feet of plank walks were laid from the dwelling to and around the fog-signal house and platform near the dwelling.

Ninth District.

1195. Frankfort Pierhead, Lake Michigan, Michigan.—The following recommendation, which was made in the Board's last annual report, is renewed:

A fog bell is needed as an adjunct to the pierhead light in thick weather, when the light can not be seen. The Board does not favor the use of bells for such purposes as a rule, but it makes an exception in this case for obvious reasons. It is estimated that a bell with proper striking apparatus, to be operated by machinery, can be adjusted to the tower at a cost not exceeding \$1,000, and it is recommended that an appropriation of that amount be made for this purpose.*

1196. Portage Lake Pierhead Range, Lake Michigan, Michigan.—The following recommendation, which was made in the Board's last annual report, is renewed:

Portage Lake occupies a position in the dangerous bight between Point Betsey and Big Point Sable, and for several years has been under improvement by the United States as a harbor of refuge for the general commerce of the lake. The width of entrance, 380 feet, is exceeded by but one of the harbors, Grand Haven, on the east shore of the lake, and while the works still lack much of their projected development and the entrance depth is as yet by no means what it is designed to secure, the completion of the harbor will furnish a valuable shelter in case of need, and it has been shown that in its present condition the harbor would be of service if it were so marked by lights as to permit its use after dark. Plans and specifications were made, therefore, for the establishment of a gasoline pierhead fixed red light of the fifth order, and a fixed red tubular lantern pierhead range light at this place. Construction was begun on March 16 and completed early in May. The lights were exhibited for the first time on the night of April 30, 1891. The lights stand near the outer end of the north pier, this being the only portion of either pier that would support them. The best water is now near the north pier, but it is probable that when the construction is completed the channel will occupy a more nearly central position, and inasmuch as the harbors on the east coast are in general lighted on the south side, the Portage Lake lights should be placed on the south pier for the sake of uniformity. The focal plane of the main light is 40 feet above the level of the lake, and it can be seen from 2 to 3 miles in clear weather. The structure is a square wooden tower painted white, surmounted by a black iron lantern, with a brown parapet. The lower part of the tower is open framework, but the upper part is inclosed for a watchroom. A dwelling for the keeper should be erected on the south shore, as there are but few houses in the vicinity which could be used as quarters. The estimated cost of the building proposed is \$3,500, and it is recommended that an appropriation of that amount be made for this purpose.

1200. Grande Pointe Au Sable, Michigan.—A new force pump and 100 running feet of hose were purchased to replace those worn out.

1203. Ludington Pierhead, Lake Michigan, Michigan.—An elevated walk 754 feet long was built on the south pier. The unused elevated walk at Michigan City was removed to Ludington. The transportation was furnished by the United States engineers. This provided material sufficient for some 440 running feet. The additional material for 314 running feet was purchased. The lower portion of the beacon was inclosed with plank so as to exclude the sea and ice from the carburetter.

* The appropriation asked in the foregoing paragraph was made in the sundry civil appropriation act approved on August 5, 1892. The bell will be established as soon as practicable.

Ninth District.

The following recommendation, which was made in the Board's last three annual reports, is renewed.

The work of extending the south pier [at Pere Marquette light-station at Ludington, Mich.], on which a light has been maintained since 1870, is progressing rapidly, and will soon be completed. A steam fog signal has long been needed here, but it was deemed impracticable to establish it until the pier was finished. It is estimated that the signal will cost \$5,500, and it is recommended that this amount be appropriated therefor.

There is no dwelling at this station for the keeper. One is needed. The Board estimates that one can be built for \$4,500, and it is recommended that an appropriation of this amount be made for that purpose.

1208. *White River, Lake Michigan, Michigan.*—A new force pump and hose were provided.

1210. *Muskegon Pierhead, Lake Michigan, Michigan.*—Five posts of the elevated walk near the beacon light, which were torn away by the schooner *Maggie Dall* during a gale on November 19, 1891, were replaced.

1214. *Grand Haven, Lake Michigan, Michigan.*—A revetment 3 feet high and 22 feet long was built in front of the boathouse, and another 2½ feet high and 38 feet long was built north of the light-house. Sidewalks were renewed and various other repairs were made.

1216. *Holland Pierhead Range, Lake Michigan, Michigan.*—Three legs and the stringers and railing of the elevated walk, which were damaged by the schooner *R. Kanter*s in leaving the harbor, were replaced.

1217. *Kalamazoo Pierhead, Lake Michigan, Michigan.*—Damage was done to the pier by the steamer *Charles McVea* in colliding therewith. This put the light-house into an unsafe condition.*

1219. *St. Joseph Pierhead, front range, Lake Michigan, Michigan.*—Owing to the formation of a bar this light was discontinued on October 31, 1891. But the conditions having changed, the light was reestablished on March 31, 1892.

1220. *St. Joseph Pierhead, Lake Michigan, Michigan.*—The following recommendations, made in the Board's last two annual reports, are renewed:

This port is about midway between Chicago and Grand Haven, and has an extensive lake commerce. During thick weather steamers find it difficult to get into the harbor, as the sound of the bell at the light-tower is ineffective. This is especially so as a shoal lies off the entrance and close to the track of vessels bound to and from Chicago, outside of which the bell is barely audible, but quite unreliable. The

*The light was discontinued as a pierhead light, but it was reestablished without change of order or characteristic as a coast light, in the old light-tower surmounting the keeper's dwelling on the north side of the mouth of the Kalamazoo River, Michigan. The height of the focal plane is 35 feet above the base of the tower and 53 feet above lake level. The light should be visible in clear weather, to the observer's eye 15 feet above lake level, 14½ statute miles. It was shown for the first time on the night of August 16, 1892.

Ninth District.

Board considers that a steam fog signal is needed at this station. It can be established for \$5,000. The Board recommends that an appropriation of that amount be made therefor.

1221. St. Joseph, Lake Michigan, Michigan.—The plank sidewalk in front of the light-house premises, 6 feet wide and 132 feet long, was renewed. Various repairs were made.

1222. Michigan City, Lake Michigan, Indiana.—A number of persons have occupied the light-house grounds without authority. Measures have been taken to cause them to remove their shanties and other property.

1225. Chicago Breakwater (north), Lake Michigan, Illinois.—Hoisting gear of wire rope, with iron sheaves running up and down on rods from the corner of the post to the deck of the pier, and also a winch for hoisting the lantern, were provided. A small lamp house was erected at the foot of the post light.

1226. Chicago Pierhead, front range, Lake Michigan, Illinois.—A new hoisting gear of wire rope and a winch for hoisting and lowering the lantern were provided. A small lamp house was erected at the foot of the post light.

1228. Chicago River, Lake Michigan, Illinois.—The walls of the old crib in the rear of the house and tower were torn down, and a picket fence inclosing the light-house grounds, was built. Various repairs were made.

1229. Chicago Harbor, Lake Michigan, Illinois.—Contract was made on September 17, 1891, for the construction of the foundation pier or superstructure. Work was commenced at once, but owing to delays in obtaining the steel casing connecting the crib foundation with the stone superstructure, progress was slow. At the end of September the crib had been brought to a level below water line to a distance of 6 feet from the outside all around, and the steel metal work was being prepared and the stone being cut. Not until the end of November was the metal work ready for placing in the work, when it was hauled to the Chicago River light-station. The work was suspended, but was resumed in May, 1892, and at the end of the month the leveling off of the superstructure was completed; the steel casing was placed and bolted to the timber walls.

Half the drift bolts and the bags of concrete were placed, and the crib was filled with concrete to a width of from 6 to 12 feet and within 2 inches of the top of the steel casing all around, and within about 8 inches of the top of the center. Cellar and basement drain pipes were also placed. At the end of the year three courses of the cut-stone work were placed, two lower courses were backed up with concrete and rubble, all drain and soil pipes and cistern and cellar curbs were located, and the drift bolts securing the steel casing in the crib timbers below water level were driven by divers.

Ninth District.

Contract was made for the construction, delivery, and erection of the iron tower and its adjuncts. The construction of the metal work was carried on to completion, and all the work was delivered on June 25, in Chicago, ready for erection on the pier. The construction of duplicate fog-signal boilers and machinery under contract of June 23, 1891, was completed and delivered on August 31, at the light-house depot. The estimate for this work was made on the basis of work which had already been done at Sand Beach and Detroit River, Michigan. But when the bids were received it was found that the ironwork, instead of costing 4½ cents per pound, would have to be paid for at the rate of 6½ cents, costing an increased amount of \$4,300. In the preparation of this estimate the cost of the lens apparatus, \$5,600, was not included. Experience on Lake Michigan, with the low water of the seasons just passed, has shown that many constructions which have been regarded as safe heretofore are now liable to have their foundations undermined, as they are exposed by the lowness of the water to storm waves of more than ordinary height. With so important a light as this new one for Chicago, it is necessary that precaution be taken to prevent accidents which may happen to the undermining of the structure. It will be necessary to add 400 cords of riprap to the quantity now in use. The sum needed to finish this work and make it good as a light and fog-signal station is \$15,500, and it is recommended that an appropriation of this amount be made therefor.

1230. *Chicago Outer Breakwater, southeast end, Illinois.*—The lantern house was enlarged. A new hoisting gear was provided, also a winch for hoisting the lantern.

1231. *Chicago Outer Breakwater, northwest end, Illinois.*—The lantern house was enlarged. A new hoisting gear provided, also a winch for hoisting the lantern.

— *Chicago Fair Buoyage, water front of Chicago, Lake Michigan, Illinois.*—The immense traffic that will be drawn to Chicago during the continuance of the Columbian Exposition makes it necessary that the long water front of that city shall be so buoyed as to make it safe for vessels to find their way in and out of that harbor and so that they can lay there in safety. It is proposed to place there—

Ten bell buoys at a cost of	\$4,000
Five gas buoys at a cost of	12,500
Twenty iron spar buoys at a cost of	6,000
Chains, sinkers, and appurtenances	4,000
Transportation of buoys, etc., from the general depot at Staten Island, New York to Chicago	3,000
Total	29,500

It is estimated that the harbor of Chicago can be properly buoyed to meet this emergency for not exceeding \$29,500, and it is recommended that an appropriation of this amount be made therefor.

Ninth District.

1234. Grosse Pointe, Lake Michigan, Illinois.—Ten-inch steam whistles were substituted for the sirens used as fog signals. The signals were finished and tested, the north one on March 30, the south one on April 23, 1892. The working of each was satisfactory. The materials needed for the erection of a circular iron oil house were delivered at the Detroit light-house depot. Various repairs were made.

1237. Kenosha Pierhead, Lake Michigan, Wisconsin.—The schooner *Evaline* ran into the light-house on the night of November 20, damaging the watchroom and carrying away the service table, closet and contents. The damage was repaired and the closet and service table replaced at small expense. Repairs were made.

1240. Wind Point, Lake Michigan, Wisconsin.—The metal work for a circular iron oil house for this station was constructed under contract. This, together with material for its erection, was delivered at the Detroit light-house depot. Various repairs were made.

1242. Milwaukee, Lake Michigan, Wisconsin.—Improvements were proposed in connection with a park, and permission was given to the municipal park commissioner to do the proposed work on the light-house grounds. There is no right of way to the light-house reservation. The value of property about that part of Milwaukee has risen during the last few years. At present it is necessary to cross private property to gain access to the light-house reservation from the land side. It is now, and has been for years, almost impossible to land supplies on the lake shore of the reservation, as there is no road from there to the present light-house. The proposed improvement will bring a street to the door of the light-station, thereby obviating all the trouble heretofore caused by the lack of a right of way.

1245, 1246. Sheboygan Pierhead Range, Lake Michigan, Wisconsin.—Measures were taken for the establishment of a pierhead range at this place. The light was exhibited for the first time on April 25, 1892. The establishment of a fog signal on this pier would aid both general navigation and the commerce of this port. It is estimated that it can be established in duplicate for not exceeding \$5,500, and it is recommended that an appropriation of this amount be made therefor.

1248. Manitowoc Pierhead, Lake Michigan, Wisconsin.—Some 620 running feet of the elevated walk, which had been torn down during the rebuilding of the pier, were rebuilt, and a fog bell and striking apparatus were provided. Various repairs were made.

With the closing of navigation through the Straits of Mackinac, the port of Manitowoc, situated as it is at the northern limit of comparatively open water during the winter, becomes the natural outlet of the region north and west, and steamers in midwinter make regular trips between it and the railroad terminal points on the eastern side of the lake. The establishment of a steam fog signal at this light-station would promote the interest of an important and growing trade.

Ninth District.

It is estimated that this aid can be established at a cost not to exceed \$5,500, and it is recommended that an appropriation of this amount be made for that purpose.

1250. *Twin River Point, Lake Michigan, Wisconsin.*—This station was repaired and renovated, and the tower was strengthened. A new barn, 16 by 24 feet in plan, was built. Sidewalks were relaid. A fence was built around the tower and dwelling to inclose the yard, which was graded, top-dressed, and sown with grass seed. Various repairs were made.

1251, 1252. *Kewaunee Pierhead Range, Wisconsin.*—On October 16, 1891, this light was moved about 200 feet nearer the outer end of the north pier, and so placed with regard to the main light as to show the course to be followed in entering the harbor.

1253. *Ahnapee Pierhead Range, Lake Michigan, Wisconsin.*—Plans and estimate of cost were made for the structures of the new range lights. The station was ready for operation at the end of the fiscal year, with the exception of the illuminating apparatus, which had not arrived.

1254. *Sturgeon Bay Canal Pierhead, Wisconsin.*—A woodhouse was erected for the storage of fuel for the signals. The pier under the fire box of fog signal No. 1 caught fire on March 10, and under No. 2 signal on the 23d, disabling both fog signals. The pier under fog signal No. 1 was but slightly damaged, but the cross timbers under fog signal No. 2 were badly burned. The damage was repaired promptly. A new force pump was provided. Various repairs were made.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

A large and increasing commerce passes the canal light, both up and down the lake and through the canal to and from Green Bay. The present light on the north pierhead is flashing red of the sixth or smallest order, and is inadequate in power and elevation. The establishment of a new coast light on shore near to the light-keeper's dwelling has already been recommended, and that recommendation is now renewed. The estimated cost is \$20,000, and it is recommended that an appropriation of that amount be made therefor.

1258. *Porte des Morts, Lake Michigan, Wisconsin.*—The light was changed on September 15, 1891, from flashing white to fixed red. A circular iron oil house and the material for its erection were delivered at the station by the tender *Warrington*. Various repairs were made.

— *Porte des Morts Ranges, Lake Michigan, Wisconsin.*—The following recommendation, made in the last three annual reports of the Board, is renewed:

Range lights and fog signal on the southwest side of Plum Island will be an invaluable addition to the aids to navigation in the Porte des Morts Passage. The Board is of opinion that they should be established on Plum Island, and has so recommended in its report of 7th January, 1890. They can be built for \$21,000, and the Board renews its recommendation that an appropriation of that amount be made therefor.

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1259. *Pottawatomie, Lake Michigan, Wisconsin.*—Material for the construction of a boathouse and ways was delivered at the station by the tender *Warrington*. Various repairs were made.

— *Little Gull Island, St. Martin Passage, entrance to Green Bay, Lake Michigan, Michigan.*—The following recommendation, made in the Board's last annual report, is renewed:

St. Martin Passage, though relatively narrow, is deep and clear, and could be made by a light and fog signal on Little Gull Island, and another on the northwest end of St. Martin, a very excellent passage. It is proposed, therefore, to establish a light and fog signal on Little Gull Island. It is estimated that these can be built for \$20,000, and it is recommended that an appropriation of that amount be made for this purpose.

— *St. Martin Island, St. Martin Passage, between St. Martin and Little Gull Islands, entrance into Green Bay, Lake Michigan, Michigan.*—The following recommendation, made in the Board's last annual report, is renewed:

The passage between St. Martin and Little Gull islands, if marked by lights and fog signals, would be much safer than Poverty Island Passage, as the entrance is capacious and unobstructed. A fourth-order light and a fog signal should be established on the northwest end of St. Martin Island. It is estimated that they can be built for \$15,000, and it is recommended that an appropriation of this amount be made for that purpose.

1260. *Poverty Island, entrance to Green Bay, Michigan.*—A circular iron oil house and the material for its erection were delivered at the station by the tender *Warrington*. Various repairs were made.

— *Manistique, Lake Michigan, Michigan.*—The establishment of the Lake Michigan light and fog-signal vessels, Squaw Island light and fog signal, Seul Choix Pointe light, and the additional buoyage authorized in the northern part of Lake Michigan has made those waters reasonably safe for navigation on the route from the Straits of Mackinac to Green Bay ports, with the exception of a stretch of 45 miles between Seul Choix Pointe and Poverty Island. Pointe aux Barques is a prominent headland $24\frac{1}{2}$ miles northeast one-half north from Poverty Island light, and 23 miles west-southwest from Seul Choix Pointe light. Poverty Island light is visible $16\frac{3}{4}$ miles and Seul Choix Pointe is visible 15 miles. There is, therefore, a space of $13\frac{3}{4}$ miles off Pointe aux Barques not covered by any light. The town of Manistique, situated at the mouth of Manistique River, at the head of the bay between Seul Choix and Pointe aux Barques, has a large lumber trade and many vessels call at that port. The route north of the Beavers and along the coast down to Poverty Island passage into Green Bay is the usual route of the ore vessels to and from Lake Erie ports in northwest winds, and the shipments of ore this year from Escanaba are largely in excess, it is said, of those of any port in the world. The Board recommends that a coast light and fog signal be established on Pointe aux Barques, Lake Michigan, Michigan. It is estimated that this can be done for a sum

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not to exceed \$32,000, and it is recommended that an appropriation of this amount be made therefor.

1261. Seul Choix Pointe, Lake Michigan, Michigan.—The following is an extract of a special report of the light-house engineer upon this station, made March 17, 1892:

Pursuant to authority granted, the materials were procured and operations at the site were begun August 31. Work was continued until November 16 under very disadvantageous circumstances, the fall weather being exceptionally stormy and severe, involving much loss of time and interruption and delay to the work. Seeing that it would be impracticable to complete the station in time to have it in service by the spring of 1892, I recommended and the Board approved the construction of a temporary tower for the station light, which, in connection with the nearly completed dwelling and other necessary appurtenances, would enable the station to be put in commission. This has been done, but it was found impracticable to complete the permanent tower, which now stands 20 feet high.

It was found impracticable to complete the station with the funds on hand, as the material cost somewhat in excess of the estimate, and the cost of the camp outfit, tools, and other appliances, which might properly have been charged to the general account, since they remained in use at and for other stations, was charged to the special appropriation. The temporary tower and tramway cost about \$850, and involved extra transportation in addition, but the largest item of extra cost resulted from the fact that whereas it was expected that rubble stone for the tower and dwelling foundations could be had in situ from the excavation for the cellars as this was made, it was discovered that the material was such as to be totally unfit for the purpose in question, and it became necessary to substitute concrete for the rubble masonry designed for the station. The total extra charges against the appropriation amounted to over \$2,500 and the estimated cost of completing it in its permanent form is \$3,300. It is therefore recommended that an additional appropriation of \$3,500 be made to complete the work, this without reference to the sum of \$5,500 needed for the establishment of a steam fog signal at the station, as has already been asked for by the Board.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

It has now become evident that the interests of navigation require the establishment of a steam fog signal here. It will cost not exceeding \$5,500. The Board recommends that an appropriation of that amount be made therefor.

It is estimated that it will cost not exceeding \$3,500 to complete the work on the light-station and \$5,500 to establish the needed steam fog signal, and it is recommended that an appropriation of \$9,000 be made therefor.

1262. Squaw Island, Lake Michigan, Michigan.—By the act approved on March 2, 1889, the establishment of a light-house and fog signal on Squaw Island was authorized, and by the sundry civil appropriation act approved on March 3, 1891, \$25,000 were appropriated therefor. Squaw Island is at the northern end of Lake Michigan and is the northernmost of the Beaver Island group. It measures about 600 yards in an east and west direction and about 1,000 yards north and south, and rises from 8 to 12 feet above the lake level. It consists of sand and gravel with light loam soil and is thickly covered with vege-

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tation of evergreen and birch, mostly of small timber. The entire northern portion surrounding the light-house has been cleared, together with a small portion at the southern extremity, in order that the light may be seen through the passage north of High Island. It was decided to establish a light and fog signal on Squaw Island so that the passage to the westward of Beaver Island might be made at all times with greater safety. Negotiations were in progress during a number of months with the owners of the island to obtain title to the site. Their offer to sell the entire island for \$2,000 was accepted and the title papers were prepared. Detailed plans, estimate, and descriptive specification for the light-house tower and dwelling, with fog signal and other necessary buildings, were made, together with detailed bills of material required for the erection of the station. Contract was made April 22 for the construction of the metal work, which was completed and delivered in June. The material and workmen for the erection of the station were landed on the island by the tender *Amaranth* on May 12, and the work of unloading was completed by the 20th. During the remainder of the month much progress was made in the construction. The station will be ready for lighting in the early fall.

This station consists of a light-house tower and keeper's dwelling, a fog-signal house, an oil house, a barn, a well and well house, a boat-house, a landing, and a tramway. The light-house and keeper's dwelling are located about 350 feet from the most northerly point of the island. The tower is built of red brick and measures 11 feet square at its base, with three projecting buttresses. It is octagonal at the top and is surmounted by an octagonal cast-iron deck with gallery railing, and a fourth-order octagonal lantern. The height from base to focal plane is 48 feet. The tower is attached to and forms the northwest corner of the keeper's dwelling. The dwelling is a two-story structure, having a vestibule and service room and a porch on the west side. It is covered by the continuation of the main roof. There is a one-story kitchen extension 15 feet square. The exterior of the building is red pressed brick, with limestone table and window sills. The roof is of shingles, painted bright red.

The fog-signal house is some 200 feet nearer the point and is about north by east from the center of the tower. It is a one-story red pressed-brick building measuring 22 by 40 feet, with a pitched roof covered with asphaltic slag roofing. This building contains duplicate fog-signal machinery, which consists of boilers, engines, and 10-inch steam whistles. The oil house is 75 feet eastward of the tower and is a square brick structure, provided with shelving to accommodate 350 gallons of oil in 5-gallon cans. The barn is about 40 feet in the rear of the dwelling. The lower part is of boards and battens; the upper part is shingled and the roof is shingled and painted red. The boat-house landing and tramway is located at the east side of the island,

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about 900 feet from the tower and dwelling. The boathouse is 16 feet by 36 feet in plan, of 1-inch boards and battens, has a shingle roof, and is painted red. Connected with it are boatways with oak rollers and a 4-ton winch. The landing is a log crib, and south of this there is a small boat landing, consisting of a crib 8 feet square with a bridge leading to the shore. A tramway extends from the boat landing westerly to the light-house, thence northerly to the fog signals. The entire length of the track is 1,176 feet. Walks of 2-inch plank are laid between the rails of the tramway, from the dwelling to the various buildings.*

— *Eleven-Foot Shoal, Green Bay, Lake Michigan, Michigan.*—The appropriation of \$60,000 made by the sundry civil appropriation act approved on August 30, 1890, for establishing a light-station on or near Eleven-Foot Shoal, off Point Peninsula, Michigan, having been found to be insufficient for that purpose, and it having been found that the need at that place, together with the need at several other places, could be met, at least temporarily, by using these funds in another way, authority was given in the sundry civil appropriation act approved on August 5, 1892, to apply this \$60,000 to "the construction or purchase and equipment of one or more light-ships for service on the Great Lakes." The Board thereupon appointed the inspectors of the ninth, tenth, and eleventh light-house districts—all lake districts—a committee, and directed them to consult with the Lake Carriers' Association, and other representatives of maritime lake interests, with a view of recommending to the Light-House Board the number of suitable light-ships which could be obtained for this \$60,000 and the locations where it is most desirable that they should be established.

The Board thinks that it is possible that four small but staunch light-ships, without steam power but with steam fog signals, can be had for this sum.

1264. Escanaba, on Sand Point, Green Bay, Michigan.—The following recommendation, which was made in the Board's last two annual reports, is renewed:

A steam signal here is not essential, as the navigation of Little Bay de Noquette is quite unobstructed, and with a steam whistle on Eleven-Foot Shoal a vessel should be able to reach the point with reasonable safety. A fog bell struck by machinery in the light-station at Escanaba, on Sand Point, would be a valuable addition to the service of this station. It can be set up for about \$1,100. It is recommended that an appropriation of this amount be made therefor.

— *Gladstone, Little Bay de Noquette, an extension of Green Bay, Michigan.*—The following recommendation, made in the Board's annual reports for the last four years, is renewed:

It is stated that the plans of the Minneapolis, Sault Ste. Marie and Atlantic Railroad, now in process of execution, will give to Gladstone the most important shipping in these waters, and that every year will augment its importance. It is stated that last year nearly 300 vessels entered that harbor, and it is expected that next year

* This station was lighted on October 10, 1892.

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the number will exceed 1,000. A light either on Sanders Point or Squaw Point will answer the purpose of guiding into Gladstone Harbor, at least for the present. It is estimated that a site can be obtained and proper structures can be erected for the establishment of a proper light at a cost of \$10,000.

Recommendation is made that an appropriation of that amount be made therefor.

1265. Cedar River Point, Green Bay, Michigan.—This station was finished during July, 1891. A good well is needed to complete the station.

1270. Menominee Pierhead, Green Bay, Michigan.—On September 10, 1891, this light was changed from a fifth to a fourth order light.

— *Peshtigo Shoal, Green Bay, Lake Michigan, Wisconsin.*—This shoal lies on the north of the Peshtigo River and projects for a long distance into Green Bay. The large and important commerce of the vicinity has for many years been seriously incommoded by the lack of a reliable mark at the end of the point. The Board is of opinion that it will be better to establish a light-house and fog signal on or near the point of Peshtigo Shoal. It is estimated that a light and fog signal can be established here for not to exceed \$10,000, and it is recommended that an appropriation of that amount be made therefor.

1272. Sherwood Point, Green Bay, Wisconsin.—The deed of the land needed for an approach to this station was returned by the register of Door County on August 27, 1891, but the separate certificates required for file with the Governor of the State of Wisconsin were not furnished. Having been duly recorded and cession of jurisdiction having been obtained from the State, the deed was returned to the Board on September 17. Plans, specifications, and estimate of cost for establishing a fog bell at this station were drawn. The fog signal was ready for use on July 1. A sidewalk was laid from the bell tower to intersect with the sidewalk on the north side of the dwelling. The boathouse was moved 27 feet nearer to the lake. A crib 8 feet square, consisting of drift logs, was built 16 feet from the old one and filled with limestone picked off the beach. The boatways were replaced and strengthened and a small crib was built for their support. Various repairs were made.

1275. Tail Point, Green Bay, Wisconsin.—The boat landing was extended some 200 feet to deeper water. Various repairs were made.

— *Menasha, Green Bay, Wisconsin.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

It is now difficult to make the Menasha River at night, on account of the cut through the rock, and the earth cut, which is found to be quite intricate. To meet this difficulty it is proposed to establish here two range lights, one to be placed on the site of the old Menasha Light, which was discontinued under the operations of the act of March 3, 1859, which site is still Government property; the other to be placed on the northeast end of Doty Island, adjacent to the channel, which was dredged out in 1887.

It is estimated that these range lights can be established for a sum not to exceed \$500, and it is recommended that an appropriation of this amount be made therefor.

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During the fiscal year repairs, more or less extensive, were made at each of the following-named stations:

1179. McGulpin Point, Mich.	1213. Grand Haven Pierhead, Mich.
1180. St. Helena, Mich.	1218. South Haven Pierhead, Mich.
1184. Wangoshance, Mich.	1220. St. Joseph Pierhead, Mich.
1185. Skilligallee, Mich.	1227. Chicago Pierhead, Ill.
1189. Charlevoix, Mich.	1236. Kenosha, Wis.
1197. Portage Lake Pierhead Range (rear), Mich.	1238. Racine (Root River), Wis.
1199. Manistee Pierhead, Mich.	1239. Racine Pierhead, Wis.
1202. Ludington Pierhead Range (front), Mich.	1241. Milwaukee Pierhead, Wis.
1206. Petite Pointe au Sable, Mich.	1243. Port Washington Pierhead, Wis.
1207. White River Pierhead, Mich.	1244. Port Washington, Wis.
1209. Muskegon Pierhead Range (front), Mich.	1247. Sheboygan, Wis.
	1269. Chambers Island, Wis.
	1274. Dunlap Reef Range (rear), Wis.

OIL HOUSES.

The metal work for eight oil houses furnished under contract was on hand at the light-house depot in Detroit at the end of the fiscal year. The stations furnished with oil houses from a previous contract were South Manitou, Michigan, Point Betsey, Michigan, Porte des Morts, Wisconsin, and Poverty Island, Michigan. Of these, that at Point Betsey is the only one erected, though the remaining three will be in place before the close of the season.

Old Mackinac Point was provided with an oil house not included in the above number. This has been delivered at the station, and the contract calls for its erection.

Of the eight oil houses mentioned, three have been delivered in the ninth light-house district at the following-named stations: Grande Pointe au Sable, Michigan, Petite Pointe au Sable, Michigan, and Twin River Point, Wisconsin.

Two of the oil houses were delivered in the eleventh light-house district, viz, Point Iroquois, Michigan, and White Fish Point, Michigan. These are in the course of erection. The remaining three are still at the light-house depot.

LIGHT-SHIPS.

1181. *Simmons Reef Light-Vessel, No. 55, off Simmons Reef, northerly end of Lake Michigan, Michigan.*

1182. *White Shoal Light-Vessel, No. 56, off White Shoal, northerly end of Lake Michigan, Michigan.*

1183. *Grays Reef Light-Vessel, No. 57, off Grays Reef, northerly end of Lake Michigan, Michigan.*

These three light-vessels were built at Toledo, Ohio, and arrived at Detroit, where they were to be turned over to the Light-House Estab-

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lishment on September 14 and 15, 1891. They were inspected by the United States local inspectors on October 2, and they passed a preliminary inspection, but many defects were developed. The trial trips took place on October 2, 5, and 6, during which the vessels showed a speed of about 8 statute miles an hour. They were then ballasted, some changes were made in the quarters of the officers and crew, the lamps were fitted to the masts and the steam fog signals were adjusted. The vessels left Detroit on October 19, 1891, and reached Port Huron that evening. The next morning they were taken in tow by the light-house tender *Dahlia*, and a speed of over 9 miles per hour was maintained, the vessels using their own steam power to assist. Bad weather coming on, the tender let go the tow rope off Sand Beach Harbor of Refuge, and each light-ship went in under the breakwater for shelter, impelled by its own power. Over 90 vessels were found in the harbor of refuge at the time. The weather moderated on the 23d, so the *Dahlia* again took the light-ships in tow, and early in the following morning passed Mackinac Point and before night the three vessels were fast to their permanent moorings. These consisted of 5-ton iron sinkers with 15 fathoms of 2-inch chain on each. The ends of the 2-inch chain were buoyed with spar buoys and were easily raised. The ends of the star-board bower chains of the light-vessels were shackled on the 2-inch chains, allowing them plenty of scope to ride to in heavy weather. The permanent moorings had been previously placed by the tender *War-rington*, under the personal supervision of the engineer of the Eleventh Light-House District, as the *Dahlia* could not handle the sinkers with her derrick. On November 17 and 20 the three light-ships left their stations without orders and ran in to Cheboygan. But they were promptly replaced by the *Dahlia* on November 22, and they remained on their stations until the close of navigation, when they put in to Cheboygan, Mich., for winter quarters. The vessels were hurriedly fitted out, that they might be of service during the latter part of the season. Hence many details of their equipment were incomplete. The work of completing them was done during the winter while they were at Duncan, Mich. The boilers were covered with mineral wool, limber chains were fitted to keep the limber holes clear and facilitate the run of any water that might get in them to the pumps. A hand pump was put in each vessel and Hancock inspirators were fitted to the boilers. The quarters in which the officers and crew live were ceiled and steam heaters were put in. The vessels were recalked outside and on deck, and the masts unnecessarily long were shortened. An additional small boat was furnished to each vessel. Lake navigation opened on April 15, 1892. These vessels left Cheboygan, their winter quarters, on April 14, and found without difficulty the spar buoys attached to the 15 fathoms of 2-inch chain of their permanent moorings. Each vessel picked up

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her moorings without assistance. The 10,000-pound sinkers do not appear to have moved since first dropped there in October, 1891. These vessels are good sea boats, and, having their own motive power, are quite efficient. The lens lanterns used are excellent and give good lights. The steam fog signals have short intervals and the blasts are easily distinguished. Vessel men speak of these light-ships as being of the greatest assistance to them in navigating the Straits of Mackinac.

The light-vessels Nos. 55, 56, and 57 were placed on their stations at Simmons Reef, White Shoal, and Grays Reef in October, 1891. Some trouble was experienced with the new keepers and engineers. Each of the vessels left their stations for winter quarters without orders before the close of navigation, but they were promptly sent back by the light-house inspector under charge of the tender. The officers and crew of these vessels, with one exception, were discharged for this dereliction of duty, and other men who have shown themselves more trustworthy, were put in their places. The vessels went on their stations this year on April 14, the season of navigation opening on the 15th, and each so far has shown itself to be an important aid to navigation.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

1178. *Old Mackinac Point, Michigan.*—The 10-inch steam whistle in duplicate was in operation some 327 hours and consumed about 52 cords of wood.

1181. *Simmons Reef Light-Vessel, Michigan.*—One 6-inch whistle was in operation some 124 hours, since October, 1891, and consumed about 4 tons of coal.

1182. *White Shoal Light-Vessel, Michigan.*—One 6-inch whistle was in operation some 144 hours, since October, 1891, and consumed about 7 tons of coal and 2 cords of wood.

1183. *Grays Reef Light-Vessel, Michigan.*—One 6-inch whistle was in operation some 222 hours, since October, 1891, and consumed about 9 tons of coal.

1184. *Waugoshance, Michigan.*—The 10-inch steam whistle in duplicate was in operation some 262 hours and consumed 9 tons of coal and 16 cords of wood.

1185. *Skilligallee, Michigan.*—The 10-inch steam whistle in duplicate was in operation some 164 hours and consumed about 14 tons of coal.

1187. *Beaver Island, Michigan.*—The first-class steam siren in duplicate was in operation some 249 hours and consumed about 1½ tons of coal and 16 cords of wood.

1193. *South Manitou, Michigan.*—The 10-inch steam whistles in duplicate were in operation some 189 hours and consumed about 6 tons of coal and 4 cords of wood.

1194. *Point Betsey, Michigan.*—The 10-inch steam whistles in dupli-

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cate, established in December, 1891, were in operation some 139 hours and consumed about 33 cords of wood.

1199. *Manistee Pierhead, Michigan.*—The 10-inch steam whistles in duplicate were in operation some 315 hours and consumed about 19 tons of coal and 33 cords of wood.

1213. *Grand Haven Pierhead, Michigan.*—This first-class steam siren was in operation 407 hours and consumed about 37 tons of coal and 6 cords of wood.

1234. *Grosse Pointe, Illinois.*—Until April 9, 1891, first-class steam sirens in duplicate and since that date 10-inch steam whistles in duplicate were in operation some 436 hours and consumed some 28 tons of coal and 2½ cords of wood.

1240. *Wind Point (Racine Point), Wisconsin.*—The 10-inch steam whistles in duplicate were in operation some 898 hours and consumed about 43 tons of coal and 4 cords of wood.

1241. *Milwaukee Pierhead, Wisconsin.*—The 10-inch steam whistles in duplicate were in operation some 1,008 hours and consumed about 38 tons of coal and 3½ cords of wood.

1250. *Twin River Point, Wisconsin.*—The 10-inch steam whistles in duplicate were in operation some 715 hours and consumed about 1½ tons of coal and 121 cords of wood.

1254. *Sturgeon Bay Canal, Wisconsin.*—The 10-inch steam whistles in duplicate were in operation some 381 hours and consumed about 38 tons of coal and 21 cords of wood.

1258. *Porte des Morts, Wisconsin.*—The first-class steam sirens in duplicate were in operation some 213 hours and consumed about 14 tons of coal and several cords of wood.

1260. *Poverty Island, Michigan.*—The 10-inch steam whistles in duplicate were in operation some 254 hours and consumed about 13 tons of coal and 3½ cords of wood.

FOG-SIGNAL BELLS OPERATED BY CLOCKWORK.

1211. *Muskegon, Michigan.*—This signal was in operation some 138 hours.

1220. *St. Joseph Pierhead, Michigan.*—This signal was in operation some 407 hours.

1227. *Chicago Pierhead, Illinois.*—This signal was in operation some 414 hours.

1248. *Manitowoc Pierhead, Wisconsin.*—This signal was in operation some 355 hours.

1272. *Sherwood Point, Wisconsin.*—This signal was completed to go into operation on July 1, 1892.

1275. *Tail Point, Wisconsin.*—This signal was in operation some 64 hours.

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Iron buoys were substituted for wooden spars at Wangoshance Shoal, Vienna Shoal, and inside of Poverty Island Passage. An iron buoy was placed off the north end of Squaw Island Shoal, which with the spar buoy also newly placed on Garden Island Shoal will, in connection with the light-vessels at Simmons Reef and White Shoal, and the new coast light at Seul Choix Pointe, assist materially in the navigation of the lake north of the Beaver Island group. Much of the buoyage in Green Bay and the southwestern side of the lake was cared for by contractors owing to the need for sending the buoy tender to Detroit each winter. The lake was practically open for navigation all last winter south of a line drawn from Sturgeon Bay Canal on the west side, to Point Betsey on the east side, and freight boats ran regularly during the winter from Kewaunee to Frankfort. This is the first winter season that vessels have run regularly across the lake so far north. As the tender will now be kept in Lake Michigan no contracts to attend the buoyage were made for the next fiscal year. The tender will take care of all the buoys hereafter, except those recently taken over from the War Department in Fox River and the buoys marking the channel to Green Bay City, also the one buoy in Muskegon Lake. It is proposed to largely increase the buoyage at the southern end of Lake Michigan from the Chicago River to the Calumet River in anticipation of an immense traffic by water during the Columbian Exhibition. The U. S. S. *Michigan* was employed during the summer on the survey of this part of the lake, and it is understood that the War Department is also engaged on the same work. When new charts are issued a scheme can be prepared for thoroughly buoying the whole front of the city of Chicago.

DEPOT.

St. Joseph, Michigan.—The deed for the site of this depot was received and recorded. A bulkhead and wharf were built. The site of the bulkhead for its entire length was dredged to a depth of 6 feet. Some 9,127 cubic yards were taken out; 4,706 yards were overcast for filling, and the remainder was dumped in the lake, as it would require a second handling to be used for filling. The work as finished consists of a bulkhead about 300 feet long and 20 feet wide, built of sheet piling of one thickness each of 2-inch and 3-inch plank, three rows of piles, the first being spaced 3 feet to centers, the second 6 feet and the third 12 feet. These carry double 12 by 12 inch superstructures on the outer and inner rows, and 12 by 12 inch cap on center row surmounted by 12 by 12 inch cross ties and 3-inch deck planking. Some 25 1-inch iron tie rods were placed at the water level to bind the front and rear walls, 23 guard or fender piles were driven in front of the bulkhead, and 7 moorings were placed. At the easterly end of the bulkhead, the wharf, of simi-

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lar construction, is 20 feet wide and 60 feet long. The Norway pine piles in the bulkhead and wharf were all peeled from the water to the top of the work. All the piles in the bulkhead and wharf were bored to a depth of about 18 inches, filled with kerosene oil and the holes stopped with pine plugs. It is expected that the buildings at this depot will be ready for occupancy this fall.

Supply and buoy depot for the Ninth and Eleventh light-house districts at Scammons Harbor, southern part of Lake Huron, Michigan.—There are now in service in the Ninth district 15 steam fog signals, and in the Eleventh district 20, a total of 35. Provision has been made by appropriation for the construction of several more in each district, the greater number of which will be erected during the coming year; and in addition there are recommendations, applications, and pending legislation, for a number, say a dozen more, for the most of which it is probable appropriation will be made in the near future. Owing to the intricacies of navigation the prevalence of fogs, and the somewhat frequent snow squalls and storms, not less than 24 or 25 of the steam signals to be operated will be concentrated about the northern portions of Lakes Huron and Michigan, counting from Thunder Bay Island in Lake Huron, through the Straits of Mackinac, to Point Betsey in Lake Michigan, and including the stations guarding the entrances into Green Bay.

The work of supplying the existing stations with coal is already arduous, and tasks the time of the buoy tenders, which might be employed to much greater advantage in other work. With the rapid increase in the number of the signals, it seems desirable that some better provision be made for the delivery of the fuel than its transportation from Detroit and Chicago by the single tender employed in each district. The average consumption of coal at each fog-signal station is 18 tons, so that for the 35 indicated stations near the northern ends of the two lakes there will be needed some 630 tons per annum. If some 200 tons additional be allowed for the use of the two tenders in the same region, the total amount required will be, say, 830 tons.

The buoyage of the two districts is also steadily increasing with the greater number, draft, and tonnage of the lake shipping. Not only are there more buoys needed, but larger ones, as special difficulties are from time to time discovered and the need is discovered of greater visibility and better warning to vessels. It is quite evident therefore that the buoy tenders will be more taxed each year to give proper attention to the placing and relief of the buoys, many of which are now looked after by contractors in each district, to maintain the necessary frequency and thoroughness of inspections, and to keep the numerous light-stations supplied with their regular stores, all within the seven or eight months of navigation during which the work must be performed.

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In the localities above indicated there are numerous points which, lying in or near the track of vessels, are dangerous to navigation by reason of not being sufficiently marked by buoys.

To provide for the convenient and economical coaling of the fog-signal stations in the two districts, it will be advantageous to establish a depot at a suitable place in the vicinity of the Straits of Mackinac, and Scammons Harbor, now owned by the Light-House Establishment, suggests itself as a place in every way desirable for the purpose. The shelter is perfect, the access is easy, and the location is sufficiently central and of ample size. It will be necessary to construct a suitable wharf, coal shed, quarters for station-keeper, and other adjuncts for coaling service. In addition there should be two scows for the service of the depot, the employment of which would, in general, be as follows:

To coal the steam fog signals the scows would be loaded to a draft of say 3 feet and be towed from the depot to the stations. In ordinary cases the scow could go alongside and the coal be handled ashore directly and without loss of time, instead of being loaded as now into a boat from a light-house tender lying off at a distance, from which several trips must be made with oars to complete the work.

A preliminary estimate of the cost of the plant recommended is as follows:

For the wharf and buoy shed.....	\$7,500
For quarters, etc.....	3,000
For two scows.....	4,000
Contingencies	500
Total	15,000

With the multiplication of the aids to navigation in the vicinity of the Straits of Mackinac, the economy of using in certain localities light-ships of moderate dimensions and small cost, in lieu of permanent light-stations, it is evident that the construction of the coaling and buoy depot for the common use of both the Ninth and Eleventh Districts will be of great value to the Light-House Service. It is estimated that this depot can be established for not exceeding \$15,000, and it is recommended that an appropriation of this amount be made therefor.

TENDERS.

The Dahlia.—The *Dahlia* was employed during July, 1891, in coaling the steam fog signals in the northern part of the district. The light-vessels which were built at Toledo, Ohio, were to have been delivered by the contractor at Detroit. The *Dahlia* remained there that her crew might assist in fitting out these vessels. The tender left Detroit on October 19 with the light-vessels, and to increase their speed took them in tow from Port Huron up to Mackinac. She arrived in the Straits of Mackinac on October 24 and put all three vessels on their stations the same day.

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She then proceeded to Chicago, and soon after left again to supply coal for use in the watchrooms of the light-stations and to take up the buoys in the northern part of the district. She completed this work and arrived at Mackinac City on November 20. The three light ships having left their moorings without orders and run in for shelter on November 22, the *Dahlia* replaced them on their stations. She then went to Detroit, and after landing buoys, etc., went to Cleveland, Ohio, where she arrived on November 30. After taking out and storing all the equipment, on December 10 the crew was discharged and the vessel was laid up for the winter. While at Cleveland she received a new boiler, a new main deck, new main rail and covering boards, and other much needed repairs. Advantage was taken of this time to rearrange the quarters for officers and men, storerooms, etc., to make the vessel more comfortable and convenient. The *Dahlia* arrived at Mackinac City on April 16 with buoys for the Ninth Light-House District, which she had taken on at Detroit. The inspector joined the vessel at Mackinac City and commenced placing the buoys in position. The weather being generally favorable, the work was completed and the *Dahlia* arrived at Chicago on May 1. The annual supplies sent by rail from the general depot at Staten Island, New York, were, on May 18, all stowed on board, and the vessel left on May 25 with the inspector to inspect and supply all the light-stations. This was completed and the *Dahlia* reached Chicago again on June 21, where she was engaged until July 1 in shipping empty oil cans to the general depot and rearranging buoy supplies at the Chicago River light-station. During the fiscal year the *Dahlia* steamed some 5,875 statute miles and consumed about 349 tons of anthracite coal. She was under steam for some 166 days during the fiscal year. This excludes 71 days' detention at Detroit and 129 days' stay at Cleveland, which was really the only time she was laid up, as the crew was on board for 237 days. The vessel is now in fairly good condition.

The following recommendation, which was made in the Board's last annual report, is renewed:

The *Dahlia*, which was built in 1873 and has seen quite hard service, has nearly outlived her usefulness. The district has outgrown her powers. She has neither the speed, the power, nor the carrying capacity needed. Beside that, she burns too much coal in running her old-fashioned engines to be an economical boat.

It is deemed desirable to build a larger and faster vessel, which shall be able of herself to do the work of the district within the not too long season of navigation, and which shall be strong enough to keep at work in the young ice as long as the merchant steamers are making their trips. The number of vessels on the lakes on June 30, 1890, was, according to the Commissioner of Navigation, 3,510; and their documented tonnage was 1,063,064. The number of vessels on the lakes on June 30, 1891, was 3,600; and their documented tonnage was 1,154,870. This increase in lake tonnage calls for an increased number of aids to navigation and increased ability in the light-house tender which must care for them. It is also deemed requisite that she

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shall embody all the improvements in vessel construction, fittings, and the like, that have been found to be peculiarly applicable to vessels on the Great Lakes. In view of the fact that the Columbian Exposition is to be held at Chicago, the headquarters of the Ninth Light-House District, and the port from which the tender would hail, she should be a model light-house tender, as she would be subject to the critical examination of many officers of foreign navies, and others interested in light-house affairs, for she would of herself be one of the most characteristic exhibits of the Light-House Board. It is hoped that the *Dahlia* may be kept in working order until the new tender can be built. It is estimated that such a vessel could be built for \$95,000, and it is recommended that an appropriation of this amount be made for that purpose.

The Warrington.—This steamer was employed in delivering materials at St. Helena, Beaver Island Harbor, Beaver Island, South Fox Island, Poverty Island, Pottawatomie, Porte des Morts, Point Betsey, South Manitou, and Waugoshance light-stations, in delivering workmen and materials at Seul Choix Pointe light-station, and in placing anchors for Grays Reef, Simmons Reef, and White Shoal light-vessels. She was docked on December 5; the stern bearing received a thorough overhauling, and the bottom was calked where required. She was put into winter quarters on December 8. During the winter she was carefully overhauled and painted. The repairs were finished in ample time for the season's work.

The Amaranth.—Work on the new steamer *Amaranth* was finished under contract at Cleveland, and she was launched December 18, 1891. The machinery received a dock trial on March 5. The engines worked over four hours, mean pressure of steam 105 pounds, mean vacuum 25½ inches, revolutions 108; the boilers were tight and steamed easily, and the engines worked well. The steamer was completed and delivered at the Detroit light-house depot on April 14, on which date she made the trial trip from Cleveland in charge of the contractors. The performance of the vessel was satisfactory. Her speed in the open lake, with the wind nearly abeam and blowing a moderate gale, was 12.2 miles per hour. The maximum roll observed was 15° on either side of the perpendicular. Her speed from Bar Point to Detroit was 12.25 miles per hour, to which should be added 1½ miles an hour owing to the strong current, making an actual speed of 14 miles per hour in smooth water. The vessel is well constructed, has ample power and speed, a freight capacity of 550 tons, with a large forehold and a smaller afterhold for convenience in loading and trimming; a water-ballast tank forward, holding 40 tons, either for trimming or for holding potable water, with ample and convenient sleeping and mess accommodations for all hands; 127 electric lights on five circuits, served by a 100-light dynamo; steam capstan fore and aft; a quick-running 10-ton hoist on the upper deck, and an ash chute operated by a water jet in the firehold for the discharge of ashes. A small pump in the engine-room supplies water to all parts of the ship. The quarters, except the fore-castle, are fitted throughout with permanent washstands. There is one

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bathroom forward for the hands, another aft on the main deck for the officers, and still another in the upper deck cabin. Her qualities, capacity, and adaptability to her work are excellent when considered in connection with the fact that the appropriation of \$75,000 sufficed for her construction and equipment. The steamer was employed during May and June, 1891, in transporting a working party and materials for construction to Squaw Island light-station and to St. Marys River, Michigan.

TENTH DISTRICT.

The tenth district extends from the mouth of the St. Regis River, New York, to and including Grassy Island, Detroit River, Michigan, and embraces all the aids to navigation on the American shores of the St. Lawrence River, Lake Ontario, Lake Erie, and the Detroit River, within these limits.

Inspector.—Commander Edwin T. Woodward, U. S. Navy.

Engineer.—Maj. Lewis C. Overman, Corps of Engineers, U. S. Army, to December 30, 1891; Lieut. Col. Jared A. Smith, Corps of Engineers, U. S. Army, from December 30, 1891.

In this district there are—

Light-houses and beacon lights	71
Fog signals operated by steam	2
Fog signals operated by clockwork.	5
Buoys in position	170
Steamer <i>Haze</i> , buoy tender, and for supply and inspection	1

The lights are classified as follows:

Third order	6
Three-and-a-half order	1
Fourth order	23
Fifth order	6
Sixth order	20
Tubular lanterns	1
Lens lanterns	3
Lanterns	3
Reflectors	8

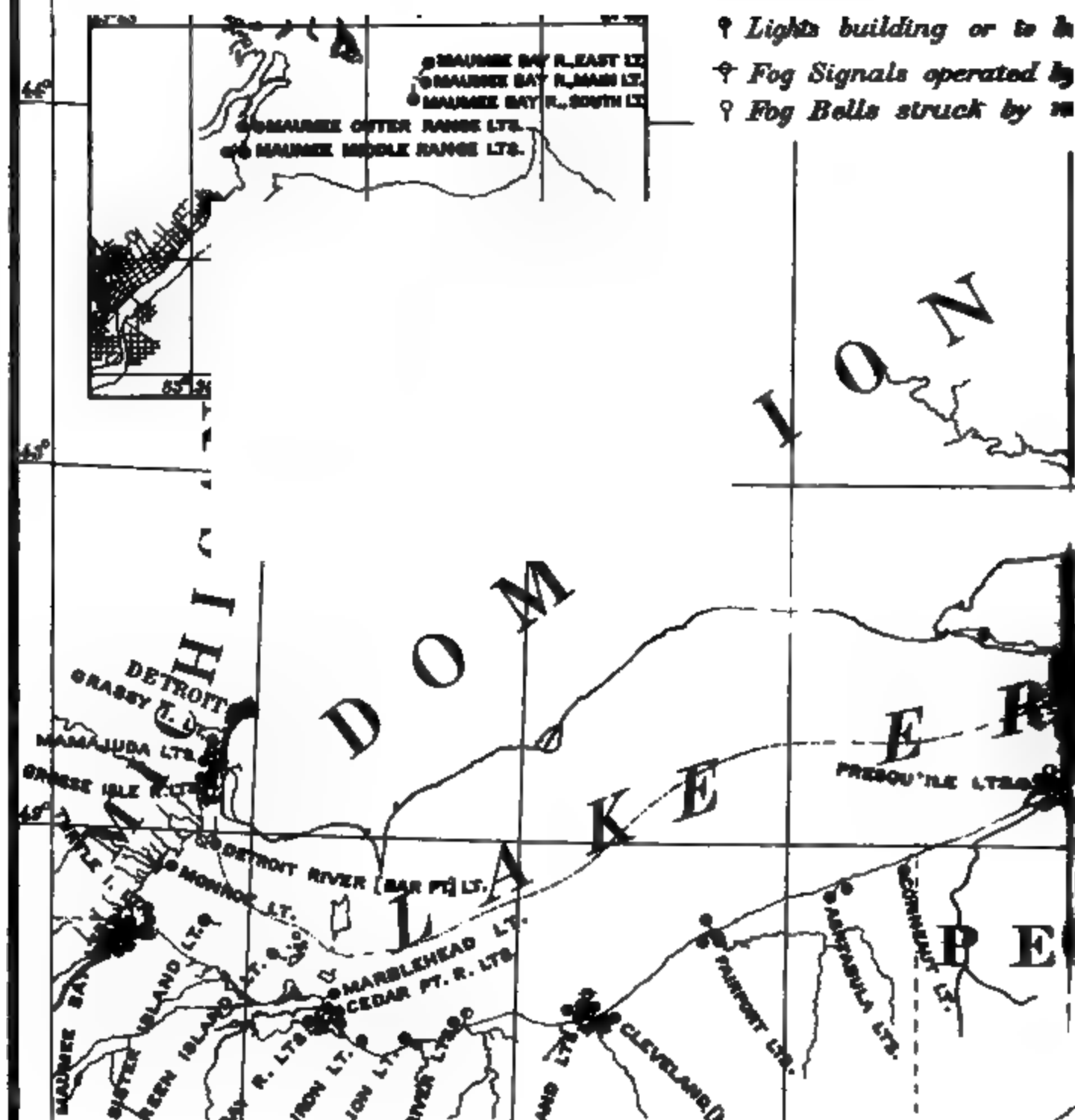
Total	71
Spar buoys	166
New lights established	2
Buoys discontinued	1
New buoys placed	1

The engineer operations have been confined to repairs, the erection of three circular iron oil houses, four skeleton iron towers for range lights, and work preliminary to the establishment of a light-station near Braddock Point, New York.

LIGHT-HOUSES.

— *Bay State Shoal, St. Lawrence River, New York.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This shoal and Oak Point Shoal, which is adjacent, are well marked with buoys which serve for crossing by daylight. The current striking vessels broadside on



[illegible]

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carries them down toward the shoals, making it difficult for them to hold their course, unless the pilot has the aid of the buoys. At night, therefore, the crossing is especially difficult and lights are needed. The act of August 2, 1888, for improving rivers and harbors, authorized a survey and examination of these shoals with a view to their removal. It is probable that an appropriation will be made for that purpose and that lights will be required here but for a few years. As the need for vessels to cross during the night is increasing each year, it is recommended that these shoals be marked by two temporary floating lights. It is estimated that two small flats, complete with masts, anchors, etc., with two sets of lantern lights, will cost \$800, and it is recommended that an appropriation of that amount be made therefor.

1003. Ogdensburg, St. Lawrence River, New York.—Three Funck-Heap tubular lamps were provided, replacing Hains lamps heretofore used. By this change a better light will be shown. A contract was made to remove the old stone kitchen, build a new kitchen, extend the roof, and make other alterations and improvements to the keeper's dwelling which is to be completed by October, 1892.

1007. Rock Island, St. Lawrence River, New York.—The superstructure for the entire length of the landing was rebuilt.

— **Carlton Island, St. Lawrence River, New York.**—The following recommendation, which was made in the Board's last two annual reports, is renewed:

Several petitions for the establishment of a light on this island have been received the past eight years, notably in 1883 and in 1888, but on each occasion has been made the subject of an adverse report. The number and size of the vessels used in the navigation of the St. Lawrence River have increased yearly. The character and demands of this trade have also changed, and where heretofore vessels would lay up rather than make night passages, they are now compelled by close competition to economize time and do so. The channel for large vessels near Carlton Island crosses from the American to the Canadian side and is both dark and obscure. The establishment here of a small light-station, similar to that at Cross-Over Island, St. Lawrence River, at a cost of \$8,600, is suggested, and an appropriation of that amount is recommended therefor.

1009. Tibbetts Point, St. Lawrence River, New York.—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This light being at the entrance of St. Lawrence River, it is important that its location be made known at all times and in all kinds of weather. The establishment of a steam fog signal at this station, at an estimated cost of \$4,300, is suggested, and it is recommended that an appropriation of that amount be made therefor.

1011. Galloo Island, Lake Ontario, New York.—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This is an important light near the lower end of Lake Ontario. It marks the outer edge of a group of islands and numerous shoals before reaching the St. Lawrence River or on the way to Sacketts Harbor. Vessel men need to locate this light as soon as possible; as fog and thick weather frequently prevail, especially in the autumn, its position should be made available by a fog signal. It is therefore recommended that a steam fog signal be established at this station at a cost not to exceed \$5,700, and that an appropriation of that amount be made therefor.

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1014. Oswego Breakwater, entrance to Oswego Harbor, New York.—The following recommendation, which was made in the Board's last two annual reports, is renewed:

Vessel men complain that they fail to hear this bell ring when the evidence of the keeper proves that it was rung. Captains report that at times they are within half a mile of the bell before they hear it. This uncertainty of a bell as a fog signal is generally admitted. The substitution of a steam fog signal for the bell is therefore recommended. It is estimated that it can be established for \$4,300, and it is recommended that an appropriation of that amount be made therefor.

1015, 1016. Fair Haven, Lake Ontario, New York.—Some 110 feet of elevated walk and about 240 feet of division fence were rebuilt. Various repairs were made.

1017. Big Sodus, Main Light, Lake Ontario, New York.—The large storm house over the rear entrance to the dwelling and cellar was enlarged so that the structure will do for a summer kitchen. The fence around the reservation was rebuilt, and a new conductor for leading water into the cistern, was provided. A circular iron oil house was erected upon a concrete foundation, and the shell of the oil house was lined with brick. It is located some 128 feet south of the keeper's dwelling and about 109 feet from the barn. Various repairs were made.

1018. Big Sodus, (outer) Lake Ontario, New York.—The *Laura*, of Windsor, Ontario, while being towed outward, sheered into and broke down some 10 feet of the elevated walk. This was repaired by the keeper.

1020. Genesee, Lake Ontario, New York.—The sum of \$25 was covered into the United States Treasury, being one year's rent for a strip of land leased to the Rochester Electric Railway Company, under lease dated January 31, 1892. The sum of \$1 was also covered into the Treasury, being the amount received for one year's rental of water front.

— **Genesee Fog Signal, Lake Ontario, New York.**—Appropriation was made for doing this work by the act approved March 3, 1891. The machinery and house are to be completed by the opening of navigation in 1893.

1022. Braddock Point, Lake Ontario, New York.—Appropriation was made for the establishment of this station by the act of Congress, approved March 3, 1891. The site was purchased, the deed approved by the Attorney-General of the United States, and recorded in the registry of deeds for Monroe County, N. Y., and the purchase money paid. Cession of jurisdiction over the reservation, though asked, has not as yet been granted by the State of New York. It is now necessary to await the assembling of the legislature in December, 1892, when it is hoped that the necessary jurisdiction will be ceded.

1024. Thirty-Mile Point, east of the Niagara River, Lake Ontario, New York.—A circular iron oil house of 225 gallons' capacity was erected

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upon a concrete foundation, and a brick lining was placed inside the shell. The house is located 50 feet west of the dwelling and on a line with the west face of the tower. Various repairs were made.

1025. Olcott, West Pier, entrance to Olcott Harbor, Lake Ontario, New York.—The work of rebuilding 656 running feet of elevated walk on the west pier, under contract dated June 16, 1891, was completed.

— *Wilson Harbor, Lake Ontario, New York.*—The following recommendation, which was made in the Board's last two annual reports, is renewed.

Within the past year certain Canadian parties have made investments and improvements in land adjoining the harbor and mouth of Wilson Creek, otherwise Twelve Mile Creek, to make a summer resort and pleasure grounds. They own a steamer which makes bidaily trips between Wilson, N. Y., and Toronto, Canada, from about June 1 to October 15, and they propose to put on a second steamer during this coming summer. The extension of a branch railroad from Lockport via Wilson to Wilson Harbor is also projected. When the steamer reaches Wilson Harbor after nightfall and when weather is thick or foggy it is difficult to make the harbor. They are obliged to "pick up" Olcott Light, which is 6 miles to the eastward, and then work slowly westward along the shore until they find the entrance between the piers at Wilson. In view of the possibility of an accident, with probable loss of life, it is deemed necessary that a temporary pier-light of the sixth order be erected on the outer end of the east pier at Wilson Harbor. It is estimated that this can be done for \$2,500. Recommendation is made, therefore, that an appropriation of this amount be made therefor.

1027, 1028. Niagara River Range, Niagara River, New York.—A circular iron oil house was provided for this range and erected upon the Black Rock beacon site. The oil house is of 225 gallons' capacity and conveniently situated. The site was resurveyed, and the boundaries were marked with stone monuments.

A permanent rear range tower was erected to take the place of the temporary tower. It is built of iron, is triangular pyramidal in shape, is painted brown, and rests upon a foundation consisting of three brick piers, to which it is securely bolted. It is fitted with hoisting apparatus, which includes a counterpoise weight. A cubby house is in the second lower section for the care of the lighting outfit. An elliptical gridiron day mark, 8 by 12 feet, with slats painted alternately black and white, is on the channel face of the upper part of the tower.

1030. Buffalo Breakwater, north end, Lake Erie, New York.—The following recommendation, which was made in the Board's last two annual reports, is renewed:

A bell is used as a fog signal at this light-station. It is ineffective. It is therefore suggested that it be replaced by a steam fog signal at a cost not exceeding \$4,300, and it is recommended that an appropriation of this amount be made therefor.*

*The appropriation recommended in the foregoing paragraph was made in the sundry civil appropriation act which was approved on August 5, 1892. The fog signal in question will be established as soon as practicable.

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1033. Dunkirk Pierhead, entrance to Dunkirk Harbor, Lake Erie, New York.—The driveway in front of the light-house premises was put in good order by the Dunkirk park commissioners, who have received permission to use that part of the light-house property for driving purposes. Various repairs were made.

1035. Presqu'ile Pierhead, entrance to Presqu'ile Bay, Erie Harbor, Lake Erie, Pennsylvania.—The beacon and fog signal have been moved to within 30 feet of the outer end of the pier, which was extended lake-ward for some 450 feet, and about 458 feet of elevated walk were built. Repairs were made to some 589 feet of the old part of the walk, and about 413 feet were rebuilt. Various repairs were made.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

A bell is used as a fog signal at this light-station. It is ineffective. It is therefore suggested that it be replaced by a steam fog signal, at a cost not to exceed \$4,300, and it is recommended that an appropriation of this amount be made therefor.

1036. Erie Range No. 1, on the north pier, entrance to Presqu'ile Bay, Erie Harbor, Pennsylvania.—One of the plates of glass in the lantern was broken by a sailing scow while entering the bay during a prevailing storm. The glass was replaced.

1038. Presqu'ile, north shore of peninsula, 3 miles from the entrance to Erie Harbor, Presqu'ile Bay, Pennsylvania.—The boathouse was removed to a new location. It was thoroughly repaired and provided with winch and ways for taking the boat out of the water. The old plank walk was relaid and extended to the boathouse. The distance from the light-station to the public dock, Erie, Pa., is nearly 3 miles, $1\frac{1}{2}$ miles being by the plank walk and $1\frac{3}{4}$ miles by water.

1039. Conneaut, just outside of Conneaut Harbor, Lake Erie, Ohio.—Water has been introduced into the keeper's dwelling. The work included the furnishing and laying below frost of 352 feet of 1-inch galvanized-iron pipe, and putting necessary fittings and plumbing inside of the dwelling. A new plank walk was laid from the keeper's dwelling to the street.

1040. Ashtabula, entrance to Ashtabula Harbor, Lake Erie, Ohio.—Some 670 square feet of concrete walk were laid. The elevated walk was damaged by vessels at different times. The owners of the *Teutonia*, in December, 1891, repaired certain small damages she had inflicted on the station. The damages done April 4, 1892, by the steamer *Lansing*, and April 23, 1892, by the schooner *S. P. Ely*, were repaired, and the owners of the respective vessels paid the cost of the repairs.

1041. Ashtabula Pierhead, entrance to Ashtabula Harbor, Lake Erie, Ohio.—Appropriation was made by the act approved on March 3, 1891, for establishing these range lights. By contract dated June 29, 1891, a triangular skeleton iron tower 65 feet high was erected upon the west

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pier to show a light in range with the pierhead beacon light. A cubby house was built in the second lower section of the tower, but the lanterns ordered not having been received, the apparatus for suspending the lights has not yet been put up. The characteristics adopted for the rear range light are three lens lanterns arranged vertically, two red and one white, with the white in the middle. It is expected to light the rear beacon on the opening of navigation in 1893. On May 17, 1892, the tower was overthrown by the schooner *Chippewa*, which collided with it while in tow of the tug *John Gordon*. The tower was reërected 5 feet farther from the channel face, at a cost of \$146.05. The establishment of the fog signal, for which appropriation was made by the act approved on March 3, 1891, was unavoidably deferred. It will probably be in operation on the opening of navigation in 1893.

1042. *Fairport, main light, mouth of Grand River, Lake Erie, Ohio.*—Water was introduced from the city water-works into the keeper's dwelling. A hand rail some 70 feet long was placed in the tower. Various repairs were made.

1043. *Fairport Pierhead, front, east pier, entrance to Fairport Harbor, mouth of Grand River, Lake Erie, Ohio.*—The outer pierhead beacon was moved some 117 feet northward to a point in the center of the pier about 28 feet from its outer end. Some 117 feet of elevated walk were rebuilt from the end of the old walk to the outer beacon. Various repairs were made.

The following recommendation, which was made in the last two annual reports is renewed:

A bell is used as a fog signal at this light-station. It is inefficient. It is recommended, therefore, that it be replaced by a steam fog signal, at a cost not to exceed \$4,300, and that an appropriation of that amount be obtained therefor.

The establishment of an inner range light at a cost not to exceed \$400 is also recommended. There is no fixed light in the harbor on which to range. Hence the pilot is at a loss at night to get a sure range toward which to head his craft in time to get her straight before making the end of the pier. A suitable range light can be erected at the cost named. It is recommended, therefore, that an appropriation of \$4,300 be made for the fog signal and of \$400 for the range light—in all of \$4,700 for Fairport.

1044. *Fairport Pierhead, rear light, east pier, entrance to Fairport Harbor, mouth of Grand River, Ohio.*—An appropriation was made by the act approved March 3, 1891, for doing this work. A skeleton iron tower was erected under contract of June 29, 1891, upon the east pier, and the material for a shelter to be built in the second section of the tower was provided. The characteristics of the rear beacon are three lights, two red and one white, arranged vertically, with the white light in the middle, shown from lens lanterns. The lanterns ordered from the general supply depot at Staten Island, New York, in March

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last, have not been received. The peculiarly exposed position of the skeleton iron tower recently erected upon the east pier at Fairport Harbor, for a rear range light, made it necessary for the safety of the structure that it be removed to a place less liable to accident from passing vessels and where the illuminating apparatus would be less exposed to the smoke and dirt incident to the handling of large quantities of iron ore and coal. The removal of the tower was safely accomplished. It now stands some 968 feet south of the beacon on the outer or north end of the east pier, some 18 feet inside of the shore line and 5½ feet from the west side or channel face of the pier, and is well secured to a foundation of timber bolted to the substructure.

1045. *Cleveland, on the hill at the east side of Cleveland Harbor, Ohio.*—The work of erecting and lining the 360-gallon circular iron oil house, furnished under contract, was completed. The house is placed within 5 feet of the west boundary line of the reservation, and in the rear of the north half of the keeper's dwelling. The Water street walk and some 539 square feet on Main street were relaid with Berea sandstone, and on Main street about 431 square feet were relaid with the stone taken from the old walk on Water street. The paving of the driveway from the lot to Water street was relaid, two new stone crosswalks of extra thickness were put in, and the stone connections between the front gateway and sidewalk, and between the sidewalk and the street, were leveled, and one piece of flagging was renewed. The exhibition of this light will be unnecessary after this season. It is not needed as a coast light. The entrance to the harbor of Cleveland is well marked by three lights, one of the fourth order, flashing red and white, and two of the sixth order, one being white, the other red. In addition to these lights, the west end of the east breakwater is marked by a red tubular lantern, suspended from a mast.

1048. *Cleveland Breakwater, on east end of the west breakwater, on the west side of the entrance to Cleveland Harbor, Lake Erie, Ohio.*—On May 12, 1892, the schooner *H. G. Cleveland* collided with the southeast corner of the pile protection of the beacon, doing damage which is estimated it will cost \$20 to repair. A request to repair the injury was sent the schooner's owners, but they have not as yet taken any action in the matter, and the repairs have not been made. On June 7, 1892, the steamer *De Pere* of the Grummond line of steamers, in getting out of the harbor, ran into the pile protection, at the east end of west breakwater, cutting through the timbers and disabling the boat cranes, doing damage which it is estimated it will cost \$200 to repair. Notice of the fact was sent to the steamer's agent at Detroit, but as yet no action has been taken by the company towards making the repairs. On October 30, 1891, the schooner *Southwest* in leaving this harbor was carried by the current in lee of the west end of the light-house crib, her jib boom came in contact with the cornice of the roof of the fog-

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signal house and raised a sheet of the metal roofing, breaking a hook of one of the guy rods attached to the smokestack of the signal. A bill for \$5.45, covering the cost of the repairs, was sent to the schooner's owner. Various repairs were made.

1049. *Cleveland East Breakwater (west end), east side of entrance to Cleveland Harbor, Ohio.*—A stanchion tower, 30 feet high, was put up by contract near the west end of the east breakwater, to take the place of the mast light now in use. The north face of the tower is protected by the timber parapet of the breakwater, which extends to half the width of the breakwater, and the west face was protected by building a bulkhead at the west end of the breakwater. The tower was to be provided with a Funck-Heap five-day lantern to take the place of the mast light now carrying a tubular lantern. The center of the tower is $21\frac{1}{4}$ feet from the west face of the breakwater and $9\frac{3}{4}$ feet from the west end of the superstructure. It was not found advisable to complete the preparation of the tower for exhibiting a light, as it was found that during the winter season of 1891-'92 the ice formation was so great as to cause a deflection of about 20 inches from a vertical line, while the mast sustained no injury beyond the loss of guide-ropes for the cage of the lantern. The mast was refitted with wire-rope guides for the lantern cage, and the light was exhibited from it as it was before.

1050. *Black River, west pier, entrance to Black River Harbor, Ohio.*—A circular iron oil house of 225 gallons' capacity was erected on the abandoned light-house crib, near the west face of the shore end of the west pier. The house rests upon a solid masonry foundation inside of the timber cribwork. A brick lining was placed around the shell of the house. An elevated passageway connects the crib supporting the oil house with the elevated walk on the pier. Various repairs were made.

1051. *Black River Pierhead Rear Range Light, near the shore end of the west pier, entrance to Black River Harbor, Lake Erie, Ohio.*—An appropriation was made for doing this work by the act approved March 3, 1891. A skeleton iron tower was erected by contract. To complete the range there remains to be built a wooden shelter in the second lower section of the rear tower, for the protection of the lens lanterns and lamps, and the apparatus put up for hoisting and suspending the lights. This work was delayed by the insufficiency of the funds remaining of the appropriation for the establishment of the range. The characteristics of this beacon are to be two red lights and one white light, suspended vertically with the white light in the middle.

A fog signal at this point would be of great local value. It is reported that the commerce here during the year 1890 amounted to 539,239 tons. It is estimated that a proper fog signal can be established here

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at a cost not to exceed \$4,300, and it is recommended that an appropriation of this amount be made therefor.

1052. *Vermillion, on the outer end of the west pier, entrance to Vermillion Harbor, Lake Erie, Ohio.*—The base of the beacon was protected with plank sheathing to prevent the direct action of the water upon the bed timbers during high winds, which had been hastening their decay. The elevated walk leading to the tower and the plank walk about the keeper's dwelling were repaired with new material, and the stone sidewalk around the light-house reservation was raised and leveled to conform to the adjoining walks.

1053. *Huron, entrance to Huron Harbor, Lake Erie, Ohio.*—The west pier having been extended, the iron beacon was moved about 120 feet to within 20 feet of the outer end of the pier. A new timber foundation was provided and some 137 feet of new elevated walk were built to connect with the old walk.

1055. *Cedar Point, entrance to Sandusky Bay, Lake Erie, Ohio.*—The protection of the cribwork from further separation was completed. The work consisted of driving a row of piles around the entire outside, securing them with double waling to prevent further canting over, and leveling the superstructure of the crib to its full height.

1056. *Sandusky Bay Range, on the outer bank at the elbow of the dredged channel, Sandusky Bay, Lake Erie, Ohio.*—At this range the decking of the crib was renewed in places. Two outrigger spars, measuring 6 by 6 inches by 20 feet, and extending 12 feet beyond the crib, were secured to the top of the crib and fitted with rope and cleats for securing the keeper's boat at times when it is impracticable, on account of storms, to enter the boat harbor.

1057. *Sandusky Bay West Range, Sandusky Bay, Ohio.*—The timbers on the south and west sides of the crib, which were cut by the ice, were removed and replaced by new ones, and both sides of the face of the crib sheathed with 2-inch plank extending 4 feet above and below the water line. Some 25 oak piles were driven in front of the south and west faces of the crib and secured with heavy oak waling to protect the crib from floating ice and uneven settlement. The entire decking of the crib was removed and replaced by new, as well as the decayed deck joist. Various repairs were made.

1058. *Sandusky Bay North Range, Sandusky Bay, Ohio.*—Four ladders were secured to the faces of the crib and 14 oak piles were driven at the corners of the crib to protect it from ice freshets. The clusters of spring piles were encircled with chains.

— *South Bass Island, Lake Erie, Ohio.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This passage is much used in place of the north passage by vessels bound to and from Sandusky and Marblehead, or to Toledo from the east, and during heavy blows

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from the northwest. There are several dangerous shoals in it, which are only marked for daylight passage, and such passages are not always practicable; hence night passages are becoming necessary. It is therefore recommended that a light be established on the southerly end of South Bass Island, to range with Green Island light and Marblehead light, at an expense not to exceed \$8,600, and that an appropriation of that amount be made therefor.

1060. *Green Island, on the west end of Green Island, Lake Erie, Ohio.*—The superstructure of the landing, which was damaged by ice during last winter, was repaired and reballasted. Various repairs were made.

— *Port Clinton, Lake Erie, Ohio.*—There is here a small local commerce. Among its vessels are eight or ten fishing tugs which constantly run in and out of the harbor. There is now no light to guide them in, the former light having been discontinued. The old light-house, which is still standing on the pier, could be put in repair and fitted up, it is estimated, for \$1,500, and it is recommended that an appropriation of this amount be made therefor.

1061. *West Sister Island, on the southwest end of West Sister Island, Lake Erie, Ohio.*—A boardwalk, some 300 feet long, was built between the dwelling and the barn. Various repairs were made.

1063. *Maumee Bay Range, Maumee Bay, Lake Erie, Ohio.*—The landing was extended by building a platform with new material over an area of double row of piling.

— *Grassy Point Range Lights, Straight Channel, Maumee Bay, Lake Erie, Ohio.*—The following recommendation, which was made in the Board's last annual report, is renewed:

This channel, when completed, will be about 8 miles long. The axis of the improved channel is the line marked by the main range crib light and the east range crib light now established in Maumee Bay. These ranges will serve to mark a part of the new channel, but additional ranges are needed to mark the inner end of the channel. The portion of the new channel inside the location of the crib ranges is practically completed, so far as excavation is concerned, and it was regularly buoyed out last spring so that it is now used by vessels. The rest of the new channel will be excavated this fall. That portion of the old channel marked by the middle and outer range lights is now but little used by vessels entering the harbor of Toledo. It is therefore recommended that range lights be established to light the straight channel in Maumee Bay, to be located near the mouth of Maumee River on the shore near Grassy Point, and to consist of a front range in shallow water built of iron on a pile foundation, and of a rear range, also to be built of iron, to be located on the land on a lot sufficiently large to afford a site for the keeper's dwelling and other needful buildings. It is estimated that these will cost \$8,000, and it is recommended that an appropriation of this amount be made for that purpose.

1063–1069. *Maumee Bay Ranges, Maumee Bay, Lake Erie, Ohio.*—The practical completion of the new Straight Channel makes changes in these ranges necessary. The Board thinks that range lights should be established at or near Grassy Point, and that the east beacon should be built farther to the eastward to make this new Straight Channel useable at night. When this is done the Outer and Middle Maumee Range lights can be discontinued. It is estimated that the proposed lights

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can be established for not exceeding \$4,100, and it is recommended that an appropriation of this amount be made therefor.

1073. *Detroit River, Bar Point, near the mouth of Detroit River, Lake Erie, Michigan.*—The damage done to the pier railing last May by the schooner *Constitution*, in tow of the steamer *Oscoda*, was repaired, and its cost was paid by the owners of the vessel. Various repairs were made.

1074, 1075. *Grosse Isle Range, between Fighting Island and Limekiln Crossing, Detroit River, Michigan.*—The ranges were made more conspicuous as day marks, and the cubby houses were changed to a position where they better protect the illuminating apparatus when lowered.

1076. *Mamajuda, on Mamajuda Shoal, Detroit River, Michigan.*—A circular iron oil house of 225 gallons' capacity was erected on a concrete foundation and lined with brick laid up in cement mortar. It is located in the southwest corner of the island, and protected from the sun by two willow trees. The timber platform around the keeper's dwelling was renewed, in doing which the tops of 85 decayed piles were cut off 8 inches below the ordinary stage of the water, a 6 by 10 inch cap was placed over the piles to receive the 10 by 12 inch by 6-foot posts which support the framework covered with 3-inch plank, and the decayed part of the fence around the platform was repaired with new material. Various repairs were made.

— *Mamajuda and Grassy Island Fisheries, Detroit River, Michigan.*—The lease of these fisheries by the United States, which was made on January 28, 1891, was revoked on November 21, 1891, by the Secretary of the Treasury, and permission was given on January 15, 1892, to the Michigan fish commissioners to occupy the fisheries without charge, for the legitimate objects of the commission.

1077. *Grassy Island, on Grassy Island Shoal, Detroit River, Michigan.*—The contract work of strengthening the cofferdam on the east and west sides of the north end, by driving a row of piles and securing the same in front of the sheet piling, was completed. Various repairs were made.

— *Detroit River.*—The following cases have been considered together, as they are necessarily closely related.

Vessel owners have been maintaining, at their own expense, the following-named private lights in the Detroit River:

A private light-ship at Bar Point, midway between Detroit River light and the Canadian light on the foot of Bois Blanc Island; two light-ships at the northwest and southwest corners of the Limekiln Crossing, and a light on Ballards Reef, Detroit River, to mark a shoal spot in the channel between the foot of Fighting Island and the Limekiln Crossing.

The commerce passing through the Detroit River is nearly all carried

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to and from United States ports and in United States vessels. The Government has expended, in making an artificial channel at the Limekiln Crossing, about \$800,000, and yet for years this artificial channel and its approaches have not been lighted by the Government, and vessel owners have been compelled, to enable them to use this channel with safety at night, to establish private lights and support them at their own expense. The private lights were not put in operation in the spring of 1891 until a few nights after the opening of navigation. During those few nights several large vessels met with disaster. Among these the splendid passenger steamer *City of Detroit* was damaged to the extent of nearly \$50,000 by striking a rock just above the Limekiln Crossing at a point where this would not have happened if Ballards Reef had then been lighted. The steamers *Milwaukee*, *Arabia*, and *New Orleans* also met with serious mishaps at this same place during the few nights that elapsed between the opening of navigation and the date when the private lights were shown.

Several additional inexpensive range lights are needed on Grosse Isle and on the north end of Mamajuda Island. These ranges are required to warn vessels off from Fighting Island, which is low and swampy, with long spits extending out from it under water at various points. Steamers frequently ground on these spits both at the foot of Fighting Island on its west side and at the head of the island. The class of large vessels now used need to keep the channel more closely than the smaller craft so much used formerly. Range lights are therefore now a necessity in places where they were not formerly required.

Additional range lights are now needed on Grossepointe to keep steamers off from the long spit at the foot of Fighting Island. Further range lights are needed at Mamajuda Island to keep vessels off the spits on its west side. Range lights are needed above Grassy Island to keep vessels in the channel and off from the head of Fighting Island. The establishment of these lights, it is believed, will make the use of this channel, which the Government has cut at so much expense, safe at night, and in the opinion of the Light-House Board they should be built as soon as practicable.

Another reason for so lighting this channel that it can be safely used at night is, that it may accommodate the enormous tonnage demanding its use. It is claimed that the volume of commerce passing through this river each year is greater than that passing through any other water way in any country. Hence it has to be used by night as well as by day, and it behooves the Government to make the channel it has cut at so much expense safe for use at all times. It is believed that this can be done by establishing the following-named aids to navigation:

— *Bar Point Light-Vessel, mouth of Detroit River, Lake Erie, Michigan.*—A private light-ship is now maintained by vessel owners off this

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point. The Board is strongly of the opinion that, if a light-ship be maintained here, it should be located in United States waters and that it should be under the orders and at the cost of the United States Government. It is estimated that a suitable vessel properly outfitted will cost not to exceed \$25,000, and it is recommended that an appropriation of this amount be made therefor.*

— *Limekiln Crossing Range Lights, Detroit River, Michigan.*—Private lights are now maintained after a fashion at these points by vessel owners. It is held that if any lights are shown here they should be kept up under the orders and the discipline of the Light-House Establishment, and therefore at the cost of the United States Government. It is claimed that this cut is to be widened ultimately. Hence, while it is necessary that the corners of the cut be lighted, it is desirable that it should be done in a proper, but at the same time in a temporary and inexpensive way. Proper floating lights can be prepared, in numbers sufficient to replace lights run down and destroyed, for an estimated sum not exceeding \$1,000.†

— *Ballards Reef Light-House, Detroit River, Michigan.*—The need for a light is shown by the fact that private lights are kept up in a certain way at this reef. The Board is of opinion that a light-house should be built on a caisson at this point, as nothing of less strength would be able to resist the ice running with the river. It is estimated that a proper structure can be built here for not exceeding \$100,000, and it is recommended that an appropriation of that amount be made therefor.

— *Grosse Isle Range Lights, Detroit River, Michigan.*—The middle of the channel from Ballards Reef to the south end of Fighting Island is now marked by a range on Grosse Isle. The Mamajuda light is but a mile above the point where that range leaves the middle of the channel. The Board recommends that another range be established on Grosse Isle, opposite the south end of Fighting Island, to mark the center of the channel from the foot of Fighting Island to Mamajuda light, to keep vessels off the spits on the west side of Fighting Island, and to mark the turning point in the river between Fighting Island and Grosse Isle. It is estimated that such a range can be established at a cost not to exceed \$2,500, and it is recommended that an appropriation of this amount be made therefor.‡

* An appropriation of \$25,000 was made in the sundry civil appropriation act approved on August 5, 1892, for placing a light-ship at Bar Point. Plans for this light-ship are now being made.

† An appropriation of \$1,000 was made in the sundry civil appropriation act approved on August 5, 1892, for placing two light-ships at the northwest and southwest corners of the Limekiln Crossing. Immediate measures will be taken for carrying this act into effect.

‡ An appropriation of \$2,500 was made in the sundry civil appropriation act which was approved on August 5, 1892, for establishing these range lights. Measures will be taken for doing this as soon as practicable.

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— *Mamajuda Range Lights, on the north end of Mamajuda Island, Detroit River, Michigan.*—The Board is convinced that a light should be established to range with the present light on Mamajuda Island so as to mark the channel between Grassy and Mamajuda islands. It is estimated that this can be done at a cost not to exceed \$1,500 and it is recommended that an appropriation of this amount be made therefor.*

REPAIRS.

At each of the following-named stations repairs, more or less extensive, were made during the year:

1004. Cross-Over Island, N. Y.	1030. Buffalo Breakwater, N. Y.
1005. Sister Islands, N. Y.	1031. Buffalo, N. Y.
1010. Sacketts Harbor, N. Y.	1034. Erie, Pa.
1011. Galloo Island, N. Y.	1054. Cedar Point, Ohio.
1013. Oswego, N. Y.	1063, 1064, 1065. Maumee Bay Ranges, Ohio.
1014. Oswego Breakwater, N. Y.	1066, 1067. Maumee Outer Range, Ohio.
1020. Genesee, N. Y.	1070, 1071. Maumee Inner Range, Ohio.
1023. Oak Orchard, N. Y.	1072. Monroe, Mich.
1026. Fort Niagara, N. Y.	

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

1048. *Cleveland Breakwater, Lake Erie, Ohio.*—This 10-inch steam whistle was in use during the year some 564 hours, and about 31½ tons of bituminous coal were consumed.

1073. *Detroit River (Bar Point), Lake Erie, Michigan.*—This 10-inch steam whistle was in use some 204 hours, and about 12½ tons of coal were burned. Some 900 pounds of this coal were consumed in keeping the pipes from freezing. The duration of fog is reported as 239 hours, during which time steam was up or was being made.

The five fog bells of the district are in good condition, and the machinery operating them is working well.

BUOYAGE.

The buoyage of the district is in good condition. The tender *Haze* cared for the buoys in Lake Erie and Detroit River, and placed those in Niagara River. The spare buoys and their appendages are, most of them, in a serviceable condition, and all of them are conveniently distributed.

DEPOTS.

Rock Island, New York.—No repairs were made and none are needed.

Buffalo, New York.—No repairs were made.

Erie, Pennsylvania.—No repairs were made.

* The appropriation asked in the foregoing paragraph was made in the sundry civil appropriation act approved on August 5, 1892. The light in question will be established as soon as practicable.

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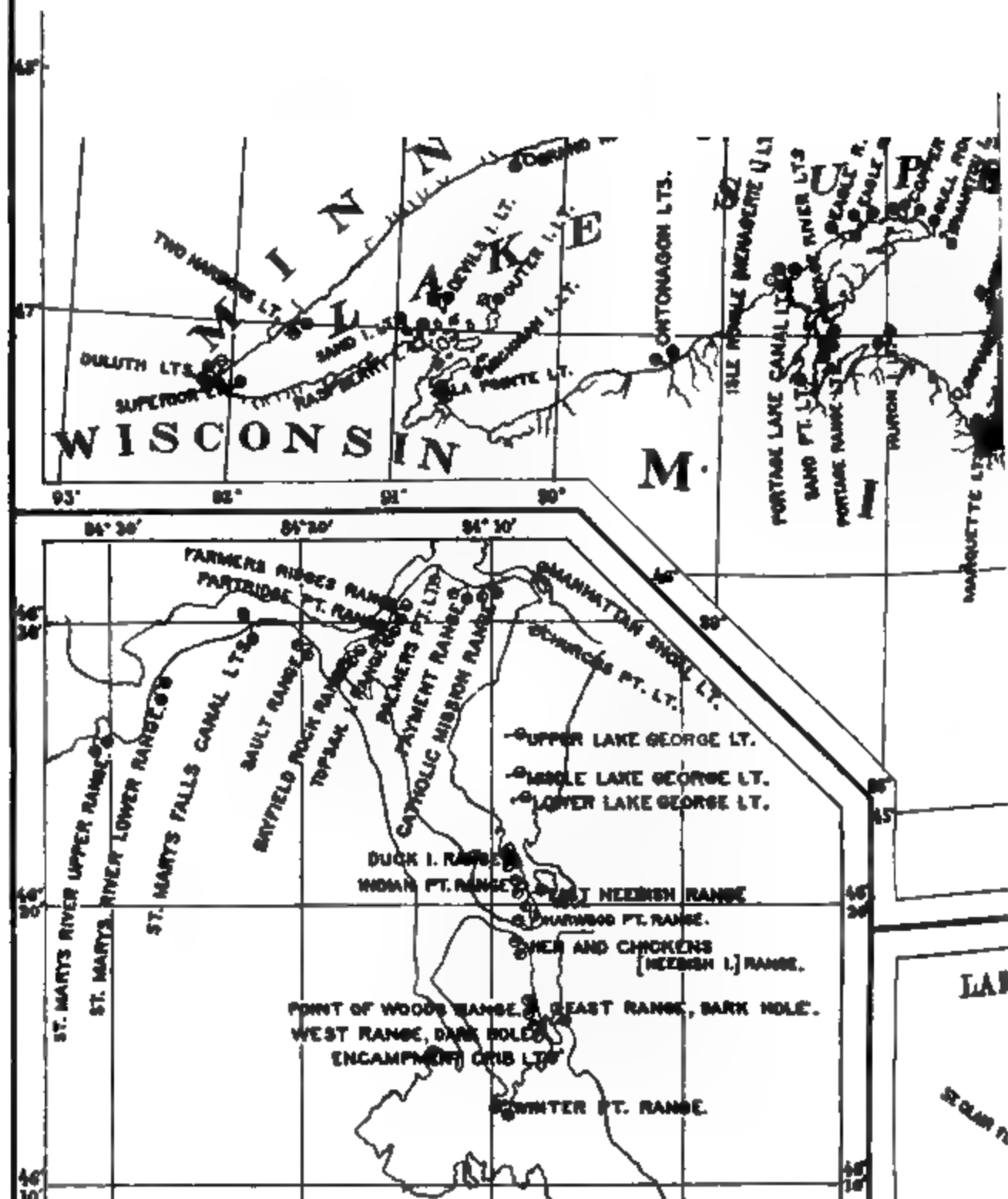
Cedar Point, Ohio.—No repairs were made.

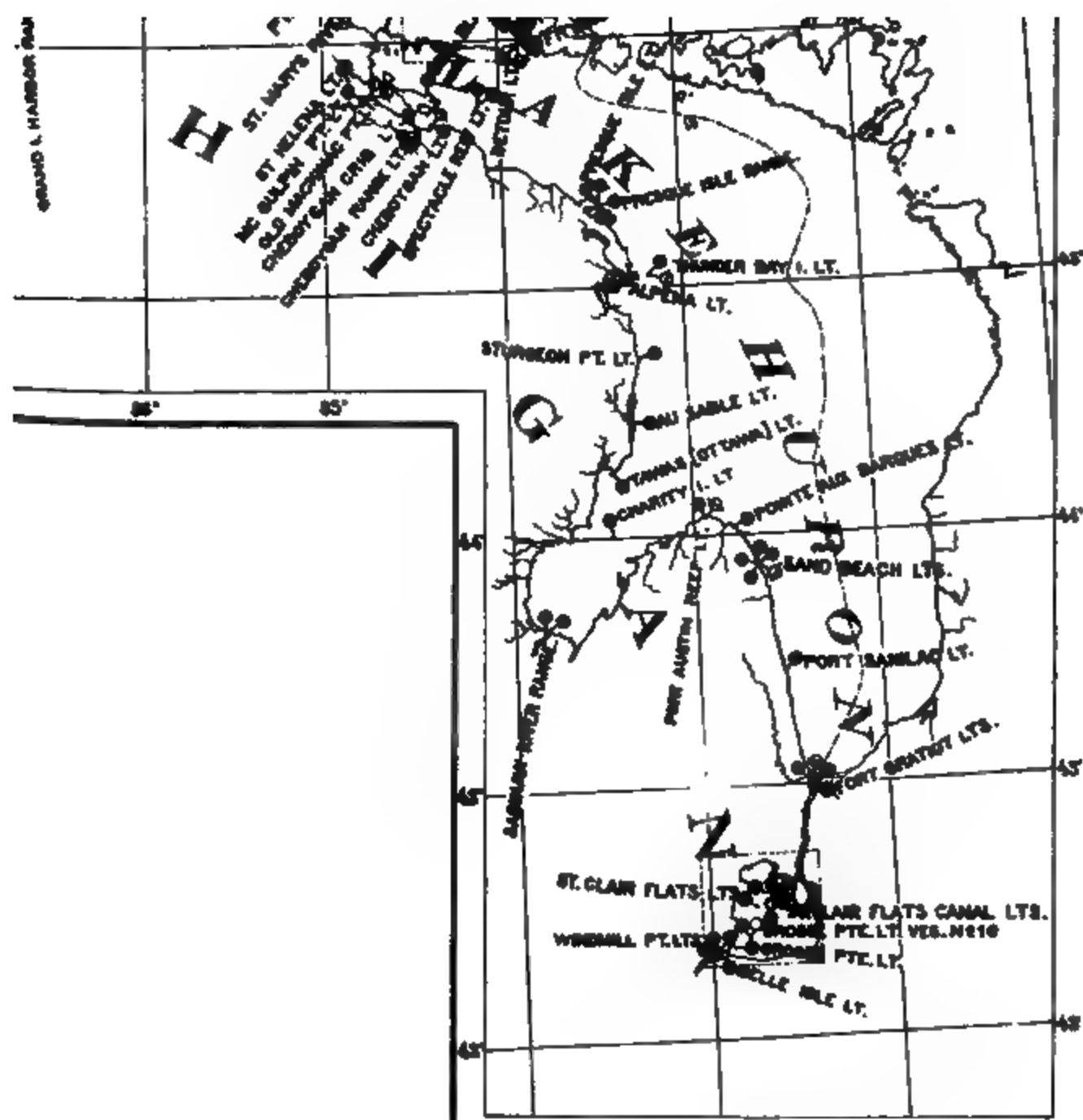
Maumee Bay, Ohio.—A platform was built over the area of double piling driven under the supervision of the United States engineer, extending the size of the landing for the light-house tender *Haze*, and increasing the conveniences for storing buoys and other materials pertaining to the light-house service.

The buoy houses of the district are in fairly good condition.

TENDER.

The Haze.—This steamer is in good condition. Minor repairs were made during the year. She was employed during the season of navigation in caring for the buoyage of Lake Erie and Detroit River, in placing buoys in Niagara River, in making inspection trips as frequently as practicable, and in supplying the light-stations. She was laid up at Detroit, Mich., on December 19, 1891, and her crew, except the officers, the carpenter, and one deck hand, was discharged. She left Detroit on April 4, 1892, on the buoy trip, and after completing that work began on June 4 the supply of light-stations, and on the 27th finished that duty. During the year she ran some 5,145 miles, and used in so doing about 255 tons of coal.





ELEVENTH DISTRICT.

This district extends from Grassy Island light-station, Detroit B to the head of Lake Superior, and covers the American shores waters of the Detroit and St. Clair rivers, Lakes St. Clair, Huron, Superior, St. Marys River, and the portion of the Straits of Mack eastward of a line from Old Mackinac Point.

Inspector.—Commander Oscar F. Heyerman, U. S. Navy, to Jun 1892; Commander Edwin T. Woodward, U. S. Navy, from Jun 1892.

Engineer.—Maj. William Ludlow, Corps of Engineers, U. S. A to June 22, 1892; Col. Orlando M. Poe, Corps of Engineers, U. S. A from June 22, 1892.

There are in the district:

Light-houses and beacon lights	
Light-ship in position	
Day or unlighted beacons	
Fog signals operated by steam	
Fog signals operated by clockwork	
Bell buoys in position	
Other buoys in position	
Steam barge <i>Warrington</i> , buoy tender, and for supply and inspection	
Steam launch <i>Lotus</i> , for construction and repair	
Steamer <i>Marigold</i> , buoy tender, and for supply and inspection	
Steamer <i>Amaranth</i> , for construction and repair	

The lights are classified as follows:

Second-order lights	
Third-order lights	
Three-and-a-half-order lights	
Fourth-order lights	
Fifth-order lights	
Sixth-order lights	
Lens-lantern lights	
Tubular-lantern lights	
Electric lights	
Total	

LIGHT-HOUSES.

— *Grassy Island Range Lights, above Grassy Island, Detroit B Michigan*.—The Board is satisfied that these ranges are needed. estimated that they can be established at a cost not to exceed \$2 and it is recommended that an appropriation of this amount be therefor.*

* An appropriation of \$1,500 was made for establishing Grassy Island Range sundry civil appropriation act which was approved on August 5, 1892. More will be taken to establish the range as soon as practicable.

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1082. *Grossepointe, Lake St. Clair, Michigan.*—This light was run into by some unknown vessel on the night of August 20, 1891, and was so seriously damaged as to necessitate its reconstruction. Its rebuilding was completed on October 17, 1891. The new beacon consists of a pile cluster composed of two rows of piles surrounding the remaining piles of the old cluster.

1100, 1101. *Fort Gratiot Range, head of St. Clair River, Michigan.*—Pursuant to the act of Congress approved March 3, 1891, appropriating \$500 for this station, plans with detailed description and estimate of cost were prepared. Materials were purchased in open market. The work on the tower was completed. The structure is a skeleton frame tower 12 feet square at the base, 4 feet at the top, and 60 feet from base to the focal plane.

1108. *Point aux Barques, Lake Huron, Michigan.*—The metal work for the circular iron oil house at this station was delivered according to contract at the light-house depot, Detroit, Mich., and the material required for its erection was also delivered at the depot. Repairs were made.

1113. *Tawas (Ottawa), Saginaw Bay, Michigan.*—This light was changed from a flashing light of the fifth order to an occulting light of the fourth order on the night of the 1st of September, 1891. Various repairs were made.

1115. *Sturgeon Point, Lake Huron, Michigan.*—The metal work for a circular iron oil house for this station was completed and delivered, according to contract, at the Detroit light-house depot, as was also the material for its erection.

1116. *Alpena, entrance to Thunder Bay River, Michigan.*—The light-house site was inclosed with a fence. Various repairs were made.

1117. *Thunder Bay Island, Lake Huron, Michigan.*—A new landing dock 100 feet long was built one-half mile north of the old wharf. Various repairs were made.

1121. *Spectacle Reef, Lake Huron, Michigan.*—The damage to the pier, caused by ice floes during the last two winters, was repaired. The material was purchased in open market and the work was done by hired labor. It was completed in August. Various repairs were made.

— *Forty-Mile Point, Lake Huron, Michigan.*—The following recommendation, which was made in the Board's last two annual reports, is renewed:

This point is understood to mean Hammond Bay, which is 40 miles to the eastward of McGulpin Point light-house. Cheboygan and Presque Isle light-houses are about 50 miles apart, with no aid to navigation between them. Considering the magnitude and value of the commerce of this vicinity the distance unmarked by a light is far too great. A light-station is needed about midway between the two. It should have not only a fog signal, but also an efficient coast light. The proper location for this is on the prominence of the coast eastward of Hammond Bay, about equidistant between Cheboygan and Presque Isle. The cost of the station complete would be

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about \$25,000. It is recommended, therefore, that a light and fog-signal station be established about midway between Cheboygan and Presque Isle light-stations at such point as the Board may fix upon on further examination, and that an appropriation of \$25,000 be made therefor.

1124. Cheboygan, Straits of Mackinac, Michigan.—The boat landing was extended by building an additional crib, and the boatways were lengthened about 75 feet. The material for this work was obtained at the station. A drive well was sunk to gravel bottom, a distance of 45 feet, and a force pump with hose was provided. The water supply pipes of the fog signals, which burst during the winter, were renewed and extended, and slight repairs were made to one of the fog-signal boilers.

1125. Cheboygan Crib, Straits of Mackinac, Michigan.—Iron boat davits were placed on the crib. Various repairs were made.

1126. Cheboygan River front range, Straits of Mackinac, Michigan.—The work of moving the front range light, including the keeper's dwelling, to the new site, was completed. A sewer leading from the cellar to the river was dug, and a 6-inch tile drain, properly trapped, was laid. Water connections from the dwelling to the city mains were made. A circular iron oil house of 360 gallons' capacity was erected. A woodshed was built. Some 418 running feet of picket fence, 6 feet high, were built to inclose the light-house site.

The following recommendation, made in the Board's last two annual reports, is renewed:

The sanitary condition of this station is bad. The light-house lot is narrow and its entire front is occupied by the light-house buildings. The cellar is often inundated and there is no drainage nor means of any except to the river over private land. It is now proposed to extend the light-house lot back to the river by purchase at an estimated expense of \$1,750. Recommendation is therefore made that an appropriation of this amount be made for this purpose.

1127. Cheboygan River rear range, Straits of Mackinac, Michigan.—A sidewalk from the beacon to the street was laid.

— **North Passage, Mission Point, Mackinac Island, Lake Huron, Michigan.**—The following recommendation, which was made in the Board's last two annual reports, is renewed:

Mission Point is understood to be on the eastern extremity of Mackinac Island, in which position a light would serve only as a general guide and be of little service for the passage of the narrow strait between Mackinac and Round islands. What is needed is a light so placed as to enable vessels to hold a close and safe course between the two, for which reason the light should be either on the spit at the western side of the harbor of Mackinac Island or on the projecting point of Round Island, directly opposite. At present there are no lights to aid the navigation of the northern channel, for which reason vessels are compelled to use the southern, with considerable loss of distance and time. The Government owns Round Island and a light-house site there would cost nothing. On Mackinac Island the land is held at a high valuation, particularly in the vicinity of the town, which is a noted summer resort, and it would be both difficult and costly to obtain a site there. It is therefore rec-

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ommended that an appropriation of \$15,000 be made for building a light and fog-signal station, not at Mackinac Island, but on Round Island, in the Straits of Mackinac.

— *St. Marys River Lights, from Pipe Island to Sault Ste. Marie, Michigan.*—Plans and specifications for eight cribs were prepared and contract was made for their construction after public advertisement. The cribs are located at Sweets Point, Sailors Encampment, Lower Lake George, Middle Lake George, Upper Lake George, Churchs Point, Manhattan Shoal and Palmers Point. At the close of the year all were completed except those at Churchs Point and Palmers Point. On June 27 a heavy northeast storm canted the Upper Lake George crib 5 feet 6 inches out of level in the direction across the diagonal. Piles were driven at the exposed angles of this crib. This was also done at the Lower and Middle Lake George and Palmers Point cribs. Masts for the exhibition of the lights were erected on the cribs already finished. Plans were prepared for permanent stations at Winter Point, Round Island, Pilot Island, and Middle Lake George, and materials were purchased after advertisement by poster and circular letter. Two skeleton iron towers were purchased, one for Winter Point and the other for Pilot Island. The working party and materials were transported from the light-house depot, Detroit, and the work of construction at Winter Point was commenced on May 5. A landing wharf 10 feet wide and 16 feet long was built for the front range light. In the center of the wharf a timber was set up with arms at the top to carry sheaves for hoisting a lantern. A lantern house was built on the wharf at the foot of the mast and a walk was built from the front to the rear range. The skeleton iron tower was erected on shore. It is triangular in plan, 60 feet from base to focal plane, with posts of 3 and $2\frac{1}{2}$ inches star iron, with lateral braces $2\frac{1}{2}$ and 2 inches star iron and brace rods $\frac{5}{8}$ -inch and $\frac{1}{2}$ -inch round iron. It is provided with a ladder, lamp carriage, and day mark. A frame dwelling one and a half stories high was constructed, as was also an oil house. The station was completed on June 23. The lights, fixed white lens lanterns, were exhibited for the first time on June 2.

The light on Sweets Point was exhibited for the first time June 8. It is a five-day lens lantern (F. W. 360°), 28 feet above lake level.

Work was begun on Pilot Island Range on June 11 and finished June 23. The rear light consists of a skeleton iron tower 36 feet high, triangular in plan, similar in construction to that at Winter Point, erected on a cluster, of 49 piles. A lamp house, $6\frac{1}{2}$ feet square and $7\frac{1}{2}$ feet high, was erected at the base of the tower. The front range was erected on Pilot Island and consists of a post 12 inches square by 30 feet high, with a house 8 by 12 feet in plan and 10 feet high, which is provided with a door and two windows, and inside with a bunk, and fitted with cleaning and storage shelves. A plank walk was laid from the door to the water's edge.

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Work was begun on Middle Lake George house June 23, and at the end of the month the house was framed, raised, covered, the roof nearly shingled, the lantern gallery placed and covered with copper, and the parapet and ironwork of the lantern erected.

On the ranges the posts were all finished and placed, with all measurements as to heights and distances made. Seven wooden targets for day marks were constructed and placed. Title papers for Winter Point and Round Island were placed in the hands of the United States attorney, and contracts for the purchase of sites for the ranges were nearly all prepared.*

In view of the great commerce and the many dangers of the St. Marys River, the Board directed the inspector and engineer of the Eleventh Light-House District to submit a plan for its further and more complete lighting, one which might, as nearly as possible, make its navigation as safe by night as by day. This plan has been received and considered and the Board now recommends that the proper steps be taken for the further and complete lighting of St. Marys River by a system involving the use of light-houses, light-vessels, range lights, buoys, and patrol steamers, which, together with the maintenance of the whole for one year, will cost not to exceed \$145,562, and recommendation is made that an appropriation of this amount be made therefor.

1134, 1135. *St. Marys River front and rear upper range, Michigan.*—Some 200 running feet of sidewalk, which were destroyed by fire in July, were renewed. The work was done by the keeper.

The following recommendation, which was made in the Board's last two annual reports, is renewed:

The conditions in the vicinity of Round Island and Point Iroquois, St. Marys River, are unsatisfactory to navigators of these waters. Owing to the insufficient depth and the narrowness of the passage, which is but a quarter of a mile wide between the 11-foot shoals bordering the channel on the St. Marys River upper range, the greater number of vessels prefer to hold the lower range until they can change course in deep water westward of the shoals. In fact, the channel through the St. Marys River upper range, was barely navigable until a cut had been dredged, which is now partly filled up, and with any sea a deep vessel can not use it. In addition to these obstructions there are several others near to the 6-fathom contour between Round Island and Iroquois Point, which are brought out by drawing the 18-foot contour. The largest has but 14 feet on it. These are now insufficiently marked by buoys. An effective guide past all these is needed. The Board suggests that it be furnished by laying out a new range on shore. This can be done most economically by abandoning the present upper range and moving the buildings to the new line, after which the St. Marys River lower range should be shifted slightly to the southward to clear the 10-foot lump now marked by the red can buoy. The cost of doing this would be about \$2,000.

* The 37 lights were established by midsummer, and are described in the Notice to Mariners issued on August 11, 1892. Since then the Harwood Point Range was established on September 8 and Round Island light was lighted on September 20, 1892. These lights are described respectively in Notice to Mariners, Nos. 74, 81, and 95, of 1892.

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This recommendation is renewed, except that the upper range should be shifted to the westward to range up White Fish Bay clear of all obstructions, when the lower range need not be moved. It is estimated that this can be done at a cost not to exceed \$5,000, and it is recommended that an appropriation of this amount be made therefor.*

1137. White Fish Point, Lake Superior, Michigan.—The drawings were prepared for revolving flash panels, etc., and the apparatus was ordered for changing the characteristic of this light from fixed white to fixed white, varied by red flashes, with twenty-second periods. The metal work for a circular iron oil house was delivered, according to contract, at the light-house depot, at Detroit, Mich., as was also the material required for its erection. Various repairs were made.

— *Grand Marais Harbor of Refuge, Lake Superior, Michigan.*—There is no harbor between White Fish Bay and Grand Island. Grand Marais has been for some time under improvement by the United States as a harbor of refuge, and the work has now advanced to a point where it is desirable to light it. It is estimated that a suitable light and bell can be established here at a cost not exceeding \$15,000, and it is recommended that an appropriation of this amount be made therefor.

1138. Big Sable, Lake Superior, Michigan.—This important light-station is on the southern shore of Lake Superior, about halfway between Marquette and White Fish Point. The entire traffic of Marquette, which, it was stated, was some 1,772,400 tons in 1890, passes close to this station, and in time of southerly gales the whole commerce of Lake Superior hugs the south shore. A steam fog signal is required to complete the satisfactory equipment of the station. It is estimated that it can be established at a cost not exceeding \$5,500, and it is recommended that an appropriation of this amount be made therefor.

1140. Grand Island Harbor, Lake Superior, Michigan.—The tower was struck by lightning on August 5, 1891, doing some damage to it and the dwelling. Due repairs were made.

1141, 1142. Grand Island Harbor Range, Lake Superior, Michigan.—Some 32 feet of sidewalk in front of the dwelling were taken up and renewed. The walk from the front walk to the west side of the dwelling was renewed and a platform was built opposite the kitchen door. The walk from the kitchen was also renewed. Various repairs were made.

— *Big Bay Point, between Granite and Huron Islands, Michigan.*—This point lies about halfway between Marquette and Portage Entry. It is a projection of the coast line about halfway between Marquette and Keweenaw Bay. There is harborage on each side of the point with

* The amount called for in the foregoing paragraph was appropriated in the sundry civil appropriation act, which was approved on August 5, 1892. The changes in this range will now be made as soon as practicable.

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certain winds, and abreast the point the coasting steamers make a change of course. It occupies a position midway between Granite Island and Huron Island, the distance in each case being about 15 to 18 miles. These two lights are invisible from each other and the intervening stretch is unlighted. A light and fog signal would be a protection to steamers engaged in passing between these points. They include all the Lake Superior passenger steamers running between Duluth, Buffalo, and Chicago which carry freight and stop between all the important points on the south side of Lake Superior, including Marquette and the copper ports on Portage Lake. Quite a number of vessels have in past years been wrecked on Big Bay Point. It is estimated that this light and fog signal can be established for not to exceed \$25,000, and the Board recommends that an appropriation of this amount be made therefor.

1149. Portage River, Lake Superior, Michigan.—The characteristic of the light was changed on August 15, 1891, from a fixed white, varied by a red flash, every two minutes, to a fixed white light, varied by a red flash, every minute. Various repairs were made.

—*Mendota, Bete Grise Bay, entrance to Lac la Belle, Lake Superior, Michigan.*—Vessels west bound try in the fall to use this point as a harbor of refuge in which to await fair weather before attempting to make the passage around Keweenaw Point. The light formerly there was discontinued in 1870, because of the failure of the local business, and the light tower was moved to and used at Marquette Breakwater. The keeper's dwelling, however, remains at Mendota. With the increase of shipping on Lake Superior, Bete Grise Bay is being largely used by day as a harbor of refuge in gales from the north to the southwest, but at night it is now almost inaccessible. If a light is placed near the head of the bay, it will be of marked advantage in guiding vessels after dark to a safe anchorage. The plan, therefore, has the Board's favorable recommendation.

It is estimated that this light can be reestablished at a cost not to exceed \$7,500, and it is recommended that an appropriation of this amount be made therefor.

1154. Copper Harbor, Lake Superior, Michigan.—A small boathouse was built by the keeper and 200 running feet of sidewalk were laid leading from the light-house to the shore.

1156. Copper Harbor Range (rear), Lake Superior, Michigan.—A landing crib 8 feet wide and 40 feet long was built of tamarack timber and filled with stone picked up on the beach. A plank walk was laid.

1157. Eagle Harbor, Lake Superior, Michigan.—The following recommendation made in the Board's last two annual reports is renewed:

A steam fog signal would be a valuable addition to the light-station at this point. It can be established for \$5,500, and the Board recommends that an appropriation of that amount be made therefor.

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1160. Eagle River, Lake Superior, Michigan.—Vessels bound east from the head of Lake Superior first make the land and commence to turn in rounding Keweenaw Point at the Sand Hills, 12 miles west of Eagle River. This point is halfway between Eagle Harbor and Ontonagon, and is 7 miles southwest of Eagle River. There is now a light at Eagle River, but it has outlived its usefulness. The local traffic of the place has stopped. It has no commerce and no harbor. There is no longer reason for continuing the light there, except as a coast light, and it is not sufficiently powerful to serve that purpose. It is proposed, therefore, to move the light from Eagle River, where it is of no use, to Sand Hills, where it would be of great service.

It is estimated that this can be done at a cost not to exceed \$20,000, and it is recommended that an appropriation of this amount be made therefor.

1162. Portage Lake Ship-Canal Pierhead, Lake Superior, Michigan.—The United States Government during the past year has purchased these lake canals at a cost of \$350,000. The light at the entrance to the canal should be supplemented by a steam fog signal to enable it to subserve its purpose during thick weather when the light can not be seen.

It is estimated that this can be done at a cost not to exceed \$5,500, and it is recommended that an appropriation of this amount be made therefor.

— *Fourteen-Mile Point, Lake Superior, Michigan.*—This prominent point is about 15 miles east of Ontonagon light, nearly at the limit of its visibility. There is no light in the southwest direction until that at Portage Lake Ship-Canal is reached, a distance of more than 40 miles. A new coast light is needed here in the interests of a large commerce to and from Ashland Bay. All this commerce passes directly by Fourteen-Mile Point on the way to and from Keweenaw Point. It is estimated that a proper light and fog signal can be established here for not to exceed \$20,000, and it is recommended that an appropriation of that amount be made therefor.

— *Chequamegon light and fog signal, Lake Superior, Wisconsin.*—The following recommendation which was made in the Board's last two annual reports is renewed:

A light on the east side of the entrance to Chequamegon Bay has been in service since 1858, and the act of October 1, 1888, authorized a fog signal at a cost of \$5,500, and on March 2, 1889, an appropriation was made therefor. This additional aid is much needed. In order, however, to fully meet the requirements of the situation, further improvements are needed. The present light is not near enough to the inner point to serve as a good guide to clear it, and it is too far from the course of vessels outside to be of the best advantage. The fog signal should be on the outer beach, about 1 mile east of the present light, and if so established the light also should be moved to the same location. To mark the inner point toward Houghton a small harbor light and fog bell struck by machinery will meet all requirements.

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The expenditures necessary are estimated as follows:

For removing and rebuilding the main light	\$7. 500
For the harbor light and bell.....	2, 500

Total estimated cost	10, 000
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The Board recommends that an appropriation of \$10,000 be made therefor.

— *Bayfield, Lake Superior, Wisconsin.*—The following recommendation which was made in the Board's last two annual reports is renewed:

The increasing commerce of the place and the fact that this is one of the best and largest harbors of Lake Superior, make it evident that a light should be established here. It is estimated that this can be done for a sum not exceeding \$5,000, and recommendation is made that an appropriation of this amount be made therefor.

1169. Devils Island, Apostle Group, Lake Superior, Wisconsin.—The following statement made in the Board's annual report for last year is repeated:

The act approved March 2, 1889, appropriated \$15,000 for building a light-station, and the act approved March 3, 1890, appropriated \$5,500 for establishing a fog signal to complete the station to be erected on Devils Island. The appropriation for the light was insufficient. Devils Island is an isolated station with no adequate harbor. The light, which is to be flashing and of the third order, will become one of the most important turning points in Lake Superior. In addition it is to have a fog signal, and provision must be made, therefore, for not less than three keepers. The station, exclusive of the fog signal, is estimated to cost \$35,000, leaving an additional appropriation of not less than \$22,000 to be made after paying for the land and other contingent expenses. In view of the improbability of securing the additional amount needed at the current session of Congress it was decided that, pending action in this regard, a temporary skeleton frame tower should be built to prevent further delay in exhibiting the light, and, while awaiting the arrival from France of the third-order flashing lens required, to exhibit a fixed red light of the fourth order. The building of the duplicate fog-signal boilers and machinery was in progress under contract at the end of the year.

This station was put in operation September 30, 1891. The Board sent all the papers relating to the title to this island, with a letter from the Attorney-General advising that the premises be acquired by condemnation, to the United States attorney, with request that proceedings in condemnation be instituted. The first meeting of the commissioners appointed by the United States circuit court at Madison, Wis., for the purpose of appraising the island, was to be held at Ashland, Wis., on April 11, 1892. Since that date no further information has been received from the United States attorney. Work was continued. The tower was built and the lantern was placed in position. The dwelling was completed. Some 100 feet of sewer leading from cellar to lake for drainage was blasted. A brick oil house and a fog-signal house were built. The boathouse, ways, and landing crib were completed. The duplicate fog-signal machinery and boilers were completed and delivered under contract. The blasting for cistern was completed and the brickwork was finished. The blasting for pump house was done and pump house built, and a covered way leading down the bank to the

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north of the signal house was constructed. The construction of the keeper's dwelling and the temporary tower was completed on October 8. A plank walk was laid in tramway. Ten acres in the vicinity of the station were cleared of trees and brush, in order that the light might be more clearly seen.

The tower is a square pyramidal skeleton frame structure 24 feet square at base, 9 feet 6 inches square at top, four stories in height, the uppermost being inclosed for a watchroom. The tower is surmounted by a square lantern gallery and an octagonal fourth-order lantern. The keeper's dwelling, located some 100 feet south of the tower, is a one-and-a-half story red brick building and extension, with roofs shingled and painted red. The fog-signal building, located some 500 feet northwest of the tower, is a one-story frame structure covered with heavy sheathing and corrugated iron outside and smooth iron inside. The oil house is a brick house with a pitched roof. The framed outbuilding, used during construction as quarters for the working parties, is one and a half stories high and has a pitched roof. For the permanent station it is proposed to duplicate the present dwelling for the assistant keepers, and connect them with a covered way, which will also lead to the tower. The tower is to be a substantial structure, bearing a third-order lantern, and measuring 70 feet from base to focal plane.

— *Superior Bay, Lake Superior, Wisconsin.*—The following recommendation, which was made in the Board's last two annual reports is renewed:

The channel in Superior Bay from the natural entrance to Connors Point should be so marked that vessels can get in or out after night without aid from tugs. It is claimed that over 900 vessels will have arrived and cleared from this port this year with a commerce exceeding \$28,000,000 in value. The largest line of steamers on the lakes makes its headquarters here. The Board is of the opinion that this channel can be sufficiently marked by lights shown from lanterns, mounted on six clusters of piles, which will burn from five to eight days without trimming, if need be. These can be built for, say \$200 each. The Board therefore recommends that an appropriation of \$1,200 be made therefor.*

1174. Two Harbors, on the point of land separating Agate and Burlington Bays, entrance to Two Harbors, Lake Superior, Minnesota.—Congress, by the act approved July 10, 1886, authorized the establishment of this light, and by the act approved on August 4, 1886, appropriated \$10,000 therefor. The act approved on October 2, 1888, renewed the appropriation originally made, and the act of March 2, 1889, appropriated \$5,500 for establishing a steam fog-signal. Title to the site selected was obtained after the usual delay, and contract was made for furnishing the material required for the construction of the buildings of the light-station. The preliminary work was started on July 15, 1891. An approach

* The amount called for in the foregoing paragraph was appropriated in the sundry civil appropriation act, which was approved on August 5, 1892. The lights will be established as soon as practicable.

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about 700 feet in length was built from the breakwater to the site; a temporary shed for the storage of material was constructed, and about one-half of the blasting for the foundation of the buildings was finished. During the months of August and September the blasting for the foundation of the dwelling was completed. The men's quarters and camp buildings were erected; the material was delivered on the pier and hoisted to the site and stored. The dwelling and tower foundation walls were built to first-story joists, and the joists and under floor were laid. The work went on through the summer and fall without interruption. The tower and dwelling were finished in November. The duplicate fog signals were erected, the fog-signal house was covered with corrugated iron on the outside, and received two coats of paint. The machinery was fitted up. The fog signals were tested in November, and found to work satisfactorily. The station was put in operation on April 15, 1892. The light-house consists of a two-story square red brick building with gables facing the southeast and west, and a tower at the southwest corner. The keeper lives in the building. The tower is surmounted by a square iron deck and standard fourth-order lantern. The height from the base to focal plane is 43 feet 6 inches. The fog signal is about 100 feet southwest from the light-house. The house is one story high and has a pitched roof. It is frame, heavily sheathed, and is covered with corrugated iron on the outside, and with plain iron on the inside. This contains duplicate fog-signal machinery, locomotive boilers, and 10-inch whistles. The water supply is a fire-plug ejector placed on a small crib, located south of the station buildings in the bay, and inside the United States breakwater.

To the rear of the house, about 40 feet distant, is an outbuilding one and one-half stories high, with space for the storage of fuel and the like. A tramway leads from the station southerly to the shore about 330 feet distant.

— *Hat or Pats Point, near Grand Portage, Lake Superior, Minnesota.*—This point is a headland with deep water on each side of it which forms a harbor of refuge for vessels in heavy northwesterly gales. Vessels then hug the north shore of Lake Superior and thus make smooth and safe water. The proposed light-station will constitute both a coast light and a guide into two excellent harbors which exist one on each side, namely, Grand Portage Bay and Wausaugoning Bay, of which the point is the dividing promontory. The harbor of refuge near this point is the only one on the north side of Lake Superior. As there is none on the Canadian side, and as it is not expected that any will be constructed or lighted on that side at an early date, the refuge afforded by the bay near Hat Point is almost the only place into which vessels can run for shelter on the north shore.

It is estimated that the light and fog signal can be established at a

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cost not to exceed \$15,000, and it is recommended that an appropriation of this amount be made therefor.

REPAIRS.

Repairs, more or less extensive, were made during the year at the following-named stations:

1078. Belle Isle, Mich.	1147. Stannard Rock, Mich.
1081. Windmill Point, Mich.	1157. Eagle Harbor, Mich.
1086. St. Clair Flats Canal (lower), Mich.	1161. Portage Lake Ship-Canal, Mich.
1102. Fort Gratiot, Mich.	1167. La Pointe, Wis.
1109. Port Austin Reef, Mich.	1171. Superior Pierhead, Minn.
1120. Presque Isle, Mich.	1172. Duluth Range (front), Minn.
1136. Point Iroquois, Mich.	1175. Grand Marais, Minn.
1139. Grand Island, Mich.	1177. Passage Island, Mich.

OIL HOUSES.

On February 26, 1892, bids were asked by advertisement for furnishing the material and labor necessary to construct and deliver at the Detroit light-house depot the metal work required for eight circular iron oil houses. The oil houses were completed and delivered in April.

LIGHT-SHIPS.

1083. Grossepoinde Light-Vessel, No. 10, Lake St. Clair, Michigan.—This vessel was thoroughly repaired in the fall and is now in good condition.

— *Poes Reef Light-Vessel, Lake Huron, near the Straits of Mackinac, Michigan.*—This dangerous reef runs out from the southeastern point of Bois Blanc Island, and on it many vessels have met disaster. The entire commerce of the Straits of Mackinac, said in 1890 to amount to 11,222,000 tons of freight, passes dangerously near this reef, and this is particularly the case with vessels bound to or from Detour. This is owing, in a large measure, to the nearness of the reef to deep water and to the heavy runs of ice in the straits during a large portion of the year. The construction of a light-house on the reef would be costly, as it would have to be sufficiently strong to resist the push of the ice. A light-ship would be preferable to a light-house here, as a light-ship can be shifted from place to place within certain limits, as circumstances may require, and as it can be brought in and put out of commission and out of expense while navigation is closed by solid ice. The Board therefore recommends the placing of a light-ship of suitable pattern at this point.

It is estimated that a suitable vessel can be provided for \$25,000, and it is recommended that an appropriation of that amount be made therefor.

Eleventh District.**FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.**

Two additional fog signals went into operation during the past year, one at Devils Island and the other at Two Harbors. This increased the number in the district to 20. As coal can be advantageously bought at Duluth, Minn., authority has been given to buy coal needed for the stations near Duluth, thus saving time and transportation. None of them except Outer Island were disabled during the year.

1102. *Fort Gratiot, Michigan.*—This 8-inch steam whistle was in operation some 137 hours, consuming about 10 tons of coal.

1104. *Sand Beach (Harbor of Refuge), north main light, Michigan.*—The 10-inch steam whistle was in operation some 151 hours, consuming about 14 tons of coal.

1109. *Port Austin Reef, Michigan.*—The first-class steam siren was in operation some 88 hours, consuming about 7 tons of coal.

1117. *Thunder Bay Island, Michigan.*—This 10-inch steam whistle was in operation some 280 hours, consuming about 20 tons of coal.

1120. *Presque Isle, Michigan.*—This 10-inch steam whistle was in operation some 446 hours, consuming about 25 tons of coal.

1121. *Spectacle Reef, Michigan.*—This 10-inch steam whistle was in operation some 278 hours, consuming about 10 tons of coal.

1122. *Detour, Michigan.*—This 10-inch steam whistle was in operation some 336 hours, consuming about 19 tons of coal.

1124. *Cheboygan, Michigan.*—This 10-inch steam whistle was in operation some 405 hours, consuming about 28 tons of coal.

1136. *Point Iroquois, Michigan.*—This 10-inch steam whistle was in operation some 421 hours, consuming about 32 tons of coal.

1137. *White Fish Point, Michigan.*—This 10-inch steam whistle was in operation some 344 hours, consuming about 20 tons of coal.

1143. *Marquette, Michigan.*—This 10-inch steam whistle was in operation some 276 hours, consuming about 13 tons of coal.

1146. *Huron Island, Michigan.*—This 10-inch steam whistle was in operation some 134 hours, consuming about 8 tons of coal.

1147. *Stannard Rock, Michigan.*—This 10-inch steam whistle was in operation some 134 hours, consuming about 11 tons of coal.

1152. *Manitou, Michigan.*—This 10-inch steam whistle was in operation some 355 hours, consuming about 26 tons of coal.

1165. *Outer Island, Wisconsin.*—This 10-inch steam whistle was in operation some 121 hours, consuming about 10 tons of coal.

1167. *La Pointe, Wisconsin.*—This 10-inch steam whistle was in operation some 189 hours, consuming about 12 tons of coal.

1169. *Devils Island, Wisconsin.*—This 10-inch steam whistle was in operation some 12 hours, consuming about 1 ton of coal.

1172. *Duluth front range, Minnesota.*—This 10-inch steam whistle was in operation some 226 hours, consuming about 15 tons of coal.

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1177. *Passage Island, Michigan.*—This 10-inch steam whistle was in operation some 309 hours, consuming about 17 tons of coal.

BUOYAGE.

There are in the district 156 buoys in position, of the following classes:

Bell buoys	1
Iron can, first-class buoys	1
Iron can, second-class buoys	1
Iron can, third-class buoys	1
Iron nun, first-class buoys	1
Iron nun, second-class buoys	6
Cedar spars, second class	7
Cedar spars, third class	3

Two new buoys were placed in position, a second-class can at the Detour entrance to the St. Marys River, and a 25-foot spar to mark the shoal off Black River, St. Clair River. No other changes or additions have taken place. The buoyage of the district was satisfactory, especially in the St. Marys River, where the patrol steamer has done its work well. In the St. Clair and Saginaw rivers the annoying and often dangerous displacement of buoys by rafts still continues. It can only be prevented by stringent legislation.

DEPOT.

Detroit, Michigan.—Both slips adjoining the light-house depot wharf were dredged by contract. Some 3,160 cubic yards were taken from the east slip, deepening it 3.2 feet, and about 4,790 cubic yards from the west slip, deepening it 4.66 feet. There is now in each slip 14 feet of water at mean stage. Bids were asked by advertisement for furnishing the material required for a lampist shop, and contract was made therefor with the lowest bidders. The work by day's labor was begun in April. The building was completed and the lampist moved from the old building into the new one in June. The building is a two-story brick structure 20 by 30 feet, with galvanized-iron cornice and roof of asphaltic slag. The first story contains one room for general work; the second, approached by circular iron stairs, contains the lampist shop, which measures 18 by 20 feet, and a dark room for photometric work, 8 by 18 feet in size.

TENDERS.

The Marigold.—This steamer is in good condition. No repairs have been required and no changes were made except as to the enlarging of her rudder, which has improved her steering qualities. She was constantly and usefully employed during the season of navigation, on inspection trips, supplying light-stations, coaling fog-signal stations

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and delivering the fuel and rations allowed to light keepers. In doing this work she steamed some 11,200 miles, and consumed about 687 gross tons of bituminous coal.

The Warrington.—This steamer underwent general repairs during the winter. The machinery, steam pipes and fittings, and the hoisting engine and pumps were thoroughly overhauled. During the latter part of April she was loaded with material for the construction of St. Marys River range lights. She left the light-house depot May 3 for St. Marys River, and from that date to the close of the year was continuously employed in delivering material and in locating the ranges, assisting in the establishment of cribs for lights, and attending working parties.

The Lotus.—The hull of the launch being in a leaky condition, was calked and sheathed with galvanized iron, and the wornout tubes of the boiler were replaced with new ones. The *Lotus* was used for landing materials at Squaw Island.

The patrol of St. Marys River.—The following recommendation, which was made in the Board's last annual report, is renewed:

An appropriation of \$4,000 was made by the act approved on March 3, 1891, "for procuring a patrol steamer for use on the St. Marys River, Michigan," for the replacement of buoys, marking the channel lines in that river, displaced by rafts or otherwise during the season of navigation. The Board thereupon contracted for the doing of this work for the sum appropriated from May 1 to November 30, 1891, being for the season of navigation in that year and during May and June of 1892. It was with great difficulty that the Board was able to induce anyone to undertake the work for the sum named, and it was only by allowing the contractor to do it by any of several steamers instead of confining one steamer to the work that it was effected.

The patrol was began on May 1, and it has proved to be a satisfactory means of keeping the buoys in place.

The work was so well done, and it effected so much in the interests of the navigation of this greatly crowded river, that the Board is constrained to repeat its recommendation of last year and to ask that \$4,000 be appropriated for procuring a patrol steamer for use on the St. Marys River during the coming year.*

An appropriation of a similar amount is needed to enable the Board to do like work next year, and it is therefore recommend that it be made.

*The appropriation recommended in the foregoing paragraph was made in the sundry civil appropriation act, approved on August 5, 1892. A steamer will be employed in patrolling this river as soon as practicable.

TWELFTH DISTRICT.

This district extends from the boundary line between California and Mexico to the boundary between California and Oregon, a distance of about 800 miles of coast line, and embraces all the aids to navigation on the seacoast, bays, and navigable rivers of California.

Inspector.—Commander Thomas Perry, U. S. Navy.

Engineer.—Maj. William H. Heuer, Corps of Engineers, U. S. Army.

There are in this district:

Light-houses and lighted beacons, including 8 post lights.....	3
Day or unlighted beacons	2
Fog signals operated by steam	5
Fog signals operated by clockwork.....	1
Whistling buoys in position.....	12
Bell buoys in position.....	4
Other buoys in position	15
Steamer <i>Madroño</i> , buoy tender, and for supply and inspection	1

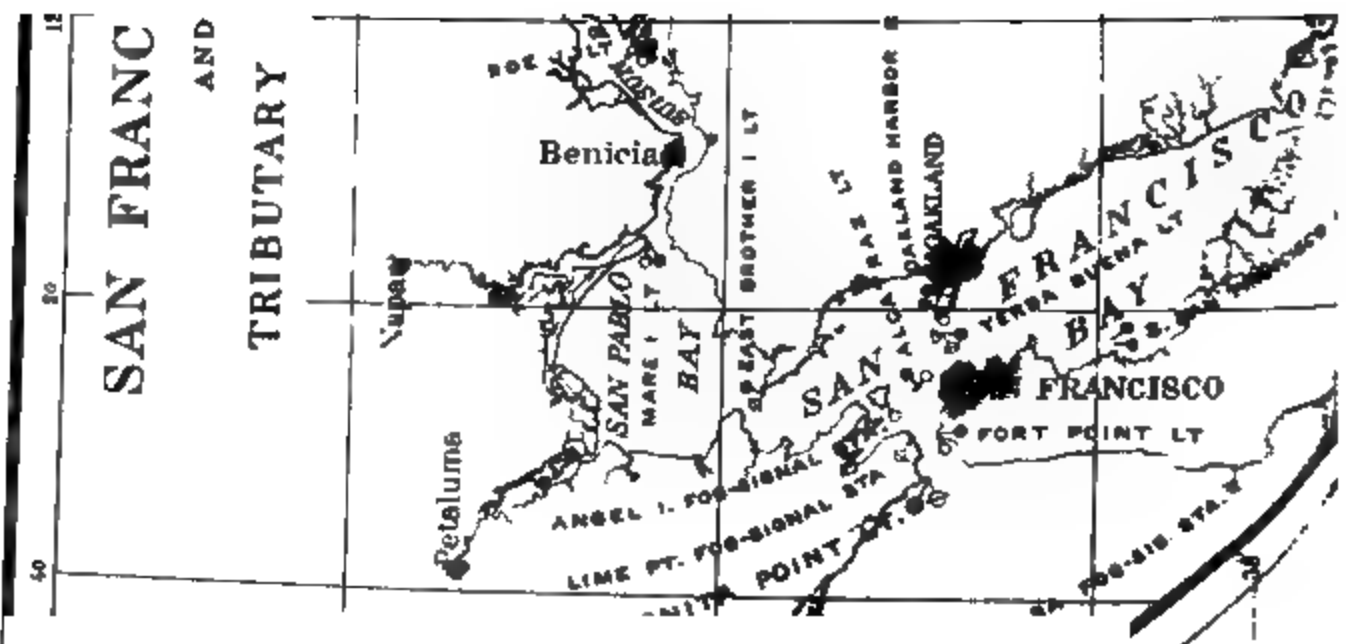
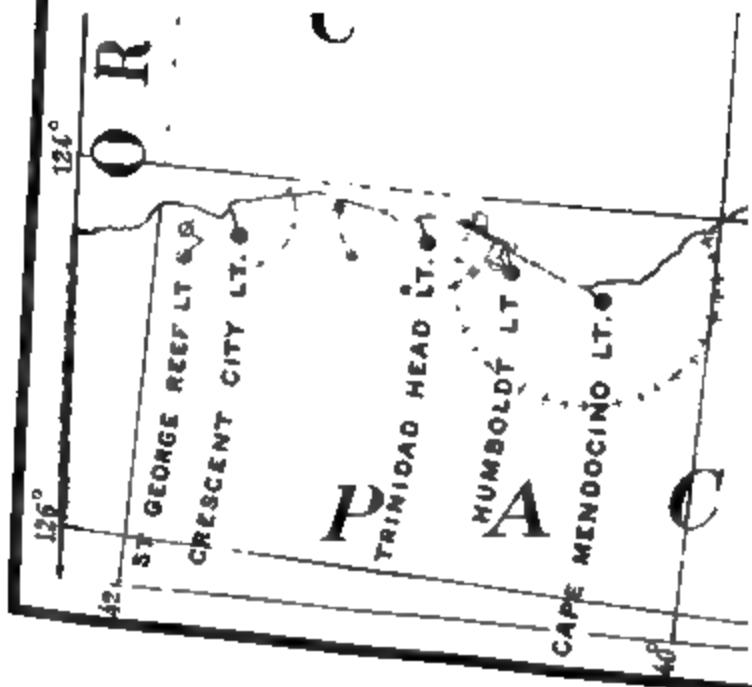
The aids to navigation in the twelfth light-house district on July 1, 1892, are classified as follows:

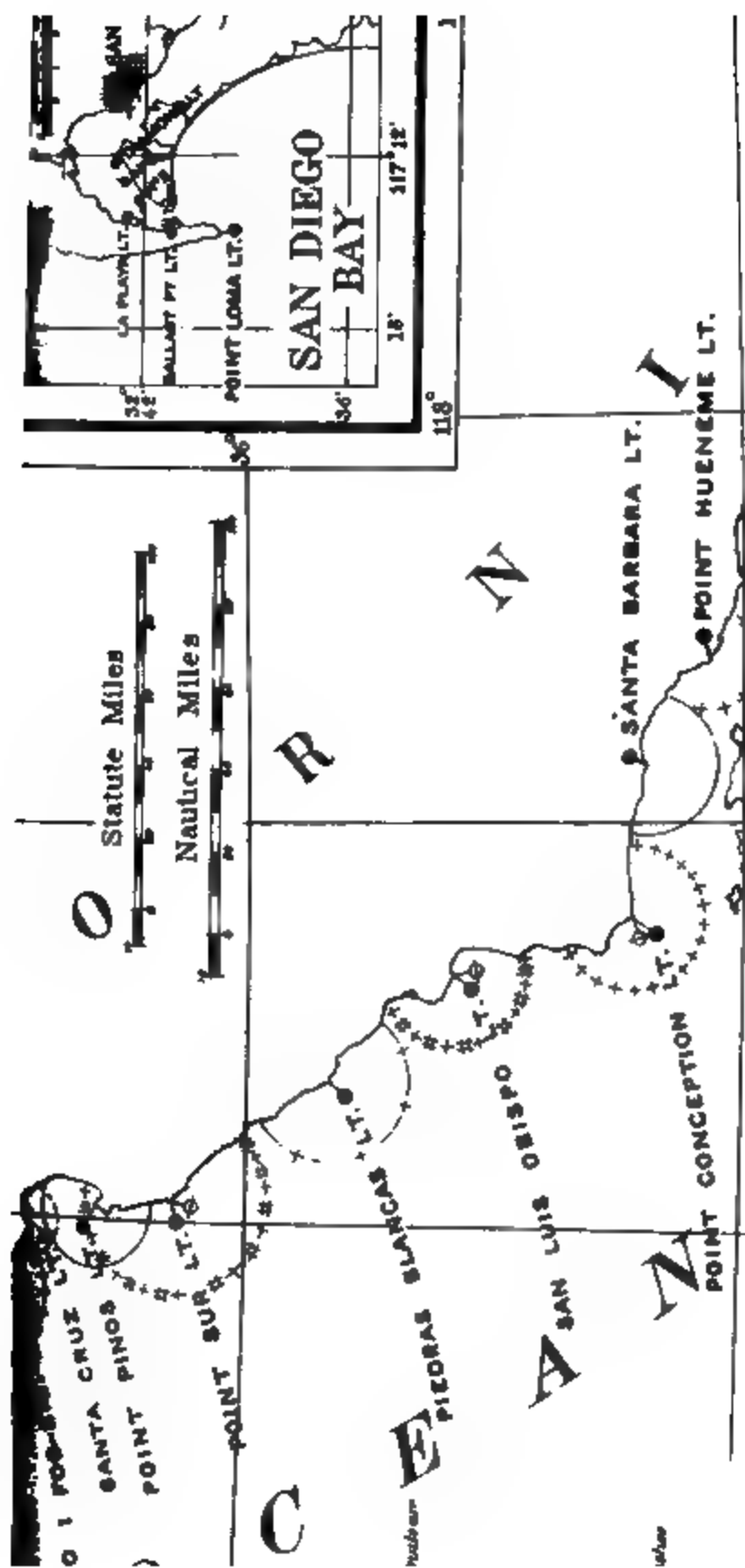
First-order lights	8
Second-order lights	1
Third-order lights.....	3
Fourth-order lights	10
Fifth-order lights	3
Lens lanterns	4
Tubular lanterns.....	3
Total	32

LIGHT-HOUSES.

823. *Point Loma, entrance to San Diego Bay, California.*—An area 30 feet square was cemented for a water shed. It was connected by a pipe line with the tanks. At the lower end of this area and on two sides of it a concrete wall was built forming a basin capable of holding 12,000 gallons of water in addition to that in the tanks.

nt, entrance to San Diego Bay, California.—The
his station were inclosed by light frame structures
lessen the evaporation of water and to protect the
rom the effect of the intense heat. Window and
put up in the dwellings, plank walks were laid con-
ant buildings, and a fence was built around the





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— *San Clemente Island, about 60 miles west of Point Loma, seacoast of California.*—The survey of this island, in progress at the time of the last annual report, was completed. It has since been determined to retain the reservation of the entire island for light-house purposes.

— *Deadman Island, at the outer end of the jetty on the east side of the entrance to San Pedro Harbor, California.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

The port of San Pedro, or Wilmington, is the seaport for Los Angeles. An enormous quantity of coal, lumber, and general freight is brought into this little harbor, which was made by breakwaters constructed by the United States. Deeply laden schooners discharge inside the harbor, while deep-water ships discharge into lighters out in the bay. It is necessary to use the tides in getting into this harbor, as there are but 12 feet of water on the bar at low tide. Fogs prevail at all seasons, and it is difficult to find the entrance at night or in foggy weather. It is recommended, therefore, that a harbor light and fog bell, operated by clockwork, be established on Deadman Island, at the entrance to this harbor, at an estimated cost of \$5,000. This small island belongs to the Government, and is large enough for the purpose.

830. *Point Hueneme, entrance to the Santa Barbara Channel, California.*—The characteristics of this light were changed on April 15, 1892, from fixed red to occulting white, with an interval of five seconds between eclipses. The apparatus used is of a new pattern devised by Maj. D. P. Heap, U. S. A., engineer of the third light-house district. Its operation is satisfactory. The ownership of the land desired for a right of way to and from this station having changed hands, it was thought that arrangements might be made to secure a title for the \$250 available. With this end in view the engineer of the district visited the station, laid out the lines of the property desired, and communicated with the new owner, but without avail. The price asked was still excessive. It was therefore decided that the land be acquired by condemnation, and the matter was placed in the hands of the United States attorney. As the \$250 now available will not be sufficient to meet the expenses of the suit and the award of damages, it is recommended that the additional sum of \$1,000 be appropriated for these purposes.

832. *Point Conception, entrance to Santa Barbara Channel, California.*—Extensive repairs were made. The coal chute leading from the top of the hill to the signal houses was entirely rebuilt, and a platform 19 by 16 feet in plan was built at the top. The barn was rebuilt. The old oil house was fitted up as a dwelling for single keepers. A fence was built around the keeper's dwelling to prevent the blowing out of sand, which has been a source of annoyance for many years. A new kitchen chimney was built, and various minor repairs were made to the several buildings. One fog-signal boiler was retubed and patched; the condition of the other was so bad that it was condemned and replaced by a new one. As one of these boilers was new and the other thoroughly repaired last year, and were both again in a leaking condition from the tubes and plates being pitted with small holes, it was

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evident that some cause other than the usual wear and tear was to be looked for. An examination of the spring water used showed the presence of sulphuretted hydrogen. This, if in sufficient quantity, would account for the condition of the boilers. The matter is under careful investigation.

— *Point Arguello, about 12 miles northwest of Point Conception, seacoast of California.*—The following recommendation, which appeared in the Board's annual report for the last three years, is renewed:

This point is about 12 nautical miles to the northward and westward of Point Conception. It is reported to be one of the foggiest places on the Pacific coast. In consequence of the sharp bend in the coast, the outlying rocks, and the almost constant fog that prevails, Point Arguello is one of the most important points on the coast at which a light and fog-signal station should be established. The United States already owns the site which is deemed most suitable for the buildings. It is therefore estimated that the work can be done at a cost not to exceed \$35,000, and it is recommended that an appropriation of this amount be made therefor.

833. *San Luis Obispo, near Port Harford, seacoast of California.*—The landing wharf at this station was strengthened and an extension resting on five piles braced to each other and to the old structure was built out 8 feet into the bay. The land connection was raised and the approach was protected by a railing. The wharf has now a frontage of 36½ feet in length by 32½ feet in width. A hoisting derrick, consisting of a mast boom, tackles, and two stiff legs was erected and boat steps were put up. Repairs were made to the conductor pipes on the dwellings.

— *Point Buchon, about 8 miles northwest from Point San Luis Obispo, California.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

This point is in San Luis Obispo County and is 17 miles distant from the town of San Luis Obispo by wagon road and trail. The nearest light-house is Piedras Blancas about 30 nautical miles to the northward and westward. The point is prominent, and with its outlying rocks is very dangerous to navigators close inshore during a fog, especially as vessels going to and from Port Harford make a sharp turn just off this point. It is estimated that a light-house and fog signal can be erected at this point for \$33,000.

835. *Point Sur, seacoast of California.*—A wooden fence was built around the dwelling and some minor repairs were made. A new whistle bell and some boiler tubes and a smokestack for the hoisting boiler were provided. A good road is needed from the station to the county road. The engineer in May selected a suitable route for this road. A survey was made. The work is to be done during the next fiscal year.

836. *Point Pinos, entrance to Monterey Harbor, California.*—The water company furnishing water to this station extended their main 1,600 feet nearer the station. This left that length of Government pipe unused. It was therefore taken up and stored at the light-house.

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The following recommendation, which was made in the Board's annual report for the last three years, is renewed:

The plot of land owned by the Government at this station does not touch the sea at any point on its boundary line. For convenience in landing stores and supplies it is essential that the United States should own the strip of land between the light-house lot and the seacoast. The owners have offered to sell the land desired for \$2,000, and the Board recommends that an appropriation be made for its purchase.

841. Farallon, on the Southeast Farallon Islet, off the entrance to San Francisco Bay, California.—A hoisting engine was provided, which, with a suitable boiler, will soon be put in position near the landing at the station. Various minor repairs were made.

845. Alcatraz, on Alcatraz Island, San Francisco Bay, California.—An electrical-bell system was put up between the signal and the dwelling, and sundry slight repairs were made.

— *San Bruno Channel, southern part of San Francisco Bay, California.*—The channel is used by a large number of sailing vessels loaded with lumber and all manner of supplies for the building operations in progress in South San Francisco. A sufficient depth of water has been obtained to enable deep-draft vessels to approach and unload at the wharves. It is proposed to establish two white signal lanterns at a point indicated. It is claimed that, with the aid of these lights, vessels will be enabled to navigate the channel at all hours of the night instead of anchoring out in the bay to await daylight, as is now done. The South San Francisco Land and Improvement Company has offered to build these lights at their own expense provided the Light-House Establishment will furnish the lanterns needed. As this company had on hand the piles and pile-drivers and all the material required for the establishment of these lights, their offer was accepted. It is estimated that it would cost the Light-House Establishment \$400 to erect these two beacons. The inspector of the Twelfth Light-House District was directed on June 9, 1892, to superintend the work and to take the proper measures for lighting the stations when they are accepted. It is expected that the lights will be in operation by September.

847. Yerba Buena Island, San Francisco Bay, California.—A new tank for the buoy depot was purchased and erected on a brick foundation. Repairs were made to the hoisting derrick on the wharf. A new boiler for the pumping engine was put in.

— *Quarry Point, Angel Island, San Francisco Bay, California.*—Various petitions were received from those representing marine interests asking that a fog signal be established at this point. The passage between the eastern side of Angel Island and Southampton Shoal is quite narrow. The strong tides setting in and out through the Golden Gate have full force on a vessel bound up or down the bay, and in the case of ships being towed, as so many are past this point, the set of the current is enough to make it hazardous, there being danger either

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of running aground on Southampton Shoal or Angel Island. An enormous quantity of shipping annually passes this point, bound to and from the great grain wharves at Port Costa, the Sacramento and San Joaquin rivers, and Mare Island Strait. Hundreds of the largest sailing ships are towed from San Francisco to Port Costa, where they load with grain and are then towed down and out to sea. In this way there is more shipping passing through these waters than anywhere else in the district except through the Golden Gate. There have been a number of casualties in the vicinity of this point. Among many were the following:

The ferry steamer *Contra Costa*, plying between San Francisco and San Quentin with passengers, ran ashore near California City.

The ship *E. B. Sutton*, while being towed down from Port Costa, ran ashore near Quarry Point, Angel Island.

The ship *Eleanor Margaret*, bound to Port Costa, ran ashore on Bluff Point, Raccoon Straits.

The ship *Maulsden*, while being towed to Port Costa, ran ashore on Southampton Shoals.

Mariners have asked that Quarry Point be selected for the fog-signal station, because, to make a start up river in a fog, it is necessary to make Angel Island to get a departure. After careful examination the Board reached the conclusion that a fog signal at this locality would be a decided aid to mariners. In view of the great economy of establishing and maintaining a large fog bell here instead of a steam fog signal, it decided in favor of the former. It is estimated that it will cost \$6,000 to establish this fog bell, and it is recommended that an appropriation of this amount be made therefor.

851. *Mare Island, entrance to Straits of Karquines, California.*—A hand winch for hoisting supplies was erected and an iron chimney was renewed. A dormer window was put in the roof. A bathroom was provided and hot and cold water led into it and into the kitchen. A landing wharf was built. The approach, 20 feet wide, starts from the southerly point of the island and extends into the bay 128 feet where it joins a T head 30 by 60 feet in plan, making the outer end 158 feet from the shore, in a depth of water of about 8 feet at low tide.

852. *Roe Island, Suisun Bay, California.*—A windmill and pump were placed on the outer end of the wharf and connection was made by pipe with the cistern to bring in a supply of fresh water. The lantern parapet was incased in redwood to prevent leakage. This island being subject to overflow at times of high water, a levee $3\frac{1}{2}$ feet high by 8 feet at the base was built around the reservation. This levee was cracked in April by a severe earthquake, and it was repaired by the keeper.

— *New York Slough, entrance to San Joaquin River, California.*—The

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following recommendation, made in the Board's last three annual reports, is renewed:

This slough consists of a short deep passage from Suisun Bay, entrance to the San Joaquin River, and necessarily has to be used by all steamers, sailing vessels, barges, etc., engaged in the great river traffic. The steamers of the California Steam Navigation Company, with three other prominent lines, besides other steamers and sailing craft, all use the slough passage. As there are no lights there are unavoidable accidents at night, and there have been frequent accidents in fog. The Board has placed post lights in the slough as a temporary expedient, but these have proved inefficient. It is therefore recommended that the proper steps be taken for placing a light and a fog signal here, and the cost is estimated at \$10,000.

— *Bodega Head, between Point Arena and Point Reyes light-stations, seacoast of California.*—The following recommendation, made in the Board's last three annual reports, is renewed:

It is recommended that a fog-signal station be established at Bodega Head, coast of California, a point $18\frac{1}{4}$ miles to the northward of Point Reyes and 49 miles to the southward of Point Arena. The stretch of coast between Point Reyes and Bodega Head is the scene of many wrecks, due to foggy weather and uncertain currents. Vessels coming down from the north, bound to San Francisco, pass close enough to Point Arena to either see the light or to hear the fog signal there and take a new departure for Point Reyes. The coast line is generally straight as far down as Bodega Head; a fog-signal station at this point would give sufficient warning to vessels which have unconsciously got in there to enable them to haul out in time to weather Point Reyes. It would be a great aid to vessels going into Bodega and Tomales bays, as well as to those going into the landings and lumber chutes immediately above Bodega. Owing to the configuration of the land and other causes, it is extremely difficult to hear the Point Reyes signal anywhere to the northward of the point. Fog, accompanied by northwest winds, varying from fresh to strong in force, prevails above Point Reyes during about nine months of the year. The currents are uncertain in direction either up or down the coast, and seem to be due to causes which exist far to the north. It has been noticed that indrafts prevail off the indentations in the coast, and the current close inshore runs in an opposite direction to what it does outside the headlands. The water is usually so deep in the regular routes up and down the coast that little, if any, use is made of the hand lead. A fog signal at this locality would therefore be of great benefit to mariners, and a small light would also be of much service, at little additional expense, as there is a stretch of unlighted territory about 68 miles in length between Point Reyes and Point Arena. The Government owns no land at Bodega; but 2 or 3 acres would be sufficient for the station, and could probably be bought for \$1,000. An engine house, such as is being constructed at San Luis Obispo, with duplicate steam fog-signal whistles, and two single dwellings for the keepers, one to have a tower for the light, as at San Luis Obispo, the other for the assistant keeper, similar to the new one designed for Point Loma light-station, with coal shed, oil house, outhouses, etc., will probably suffice to establish the station. These, it is estimated, will cost \$30,000, and it is recommended that an appropriation of this amount be made therefor.

857. *Point Arena, seacoast of California.*—One of the fog-signal boilers was repaired, a new boundary fence was built and the gates repaired, the electrical-bell system was put in good order, a new storage shed and two new tanks were erected on brick foundations, and extensive repairs were made.

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858. *Cape Mendocino, seacoast of California.*—The road leading from the county road to this station is in bad condition. For several years this piece of road, a little more than a half mile in length, has been almost impassable. It is with great difficulty and at excessive cost that teams can be hired to haul supplies to the station, and all because of this short piece of bad road. Repairs are made annually, but the grade is so steep, the rainfall is so heavy, and landslides are so frequent that it is practically impossible to maintain this road in fair traveling condition with any reasonable expenditure of money. Surveys for a practicable road to reach the station were made. Some 1,120 feet of the proposed new road are over private land, the owner of which offers to convey the right of way to the United States.

The following statement, made in the Board's last annual report, is repeated:

The road leading from the county road to this station is in bad condition. For several years this piece of road, a little more than a half mile in length, was almost impassable, and it is only with great difficulty and at an excessive cost that teams can be had to transport supplies to the station, and all in consequence of this little piece of bad road. Repairs are made annually, but the grade is so steep, the rainfall so heavy, and landslides so frequent that it is practically impossible, at any reasonable expenditure of money, to maintain this road in even a fair traveling condition. Surveys for a practicable road to reach the station were made. Some 1,120 feet of the proposed new road are over land, the owner of which offers to convey the right of way to the United States.

The following recommendation was made in the Board's last three annual reports:

"There is no practicable means of communication between the county road and the light-station. A good wagon road about a half mile long has been laid out; but it is found that while about 1,550 feet of its length is on the Government reservation some 1,120 feet are on private property. The owner offers to sell the right of way, 25 feet wide over this strip, for \$25. The cost of making the road will be about \$500. The amount of the cost of making an examination of the title and other legal expenses must be provided. It is therefore recommended that an appropriation of \$1,000 be made for the purchase of the right of way, for the legal expenses of so doing, and for building the road."

An appropriation of \$500 was made by the sundry civil act, approved on August 5, 1892, but it is insufficient. An additional appropriation of \$500 is needed to enable the Board to do the work, and it is recommended that this amount be appropriated therefor.

859. *Humboldt, entrance to Humboldt Bay, California.*—The suit brought to obtain, by condemnation, title to the land needed for the reestablishment of this station on Table Bluff was withdrawn and a compromise was made with the owner whereby the United States secured for \$2,226 some 10 acres of land, together with the right to take water from an adjacent spring. Plans and specifications for the new structures were made and advertisements were published asking bids for the work. The bids were opened March 21, 1892, and contract

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was made for the buildings, \$16,949, and for the ironwork, \$845. At the close of the fiscal year the lantern was completed and accepted. Work on the buildings was begun in May, but little progress was made. The coal shed has been put up, and it will be used as quarters for the workmen. The materials were hauled to the site, and a portion of the cellar walls was put up. No work of importance was done at the old station save some repairs to one of the fog-signal boilers.

— *Punta Gorda, between Shelter Cove and Cape Mendocino, seacoast of California.*—The following recommendation, which was made in the Board's last three annual reports, is renewed:

Between Shelter Cove and Punta Gorda there are several dangerous sunken rocks off the shore that add to the hazards of navigation. In ordinary dark nights the overhanging mountains keep the shore line in dark shadow and confuse the best navigator as to his distance from shore, so that it is impossible to make out this high rounding point, either from the south or from the north. Moreover, from reports made to the Coast and Geodetic Survey, it appears that little is known as to the currents of this part of the coast. The conclusion is reached, therefore, that the interests of commerce and navigation require that a light and fog signal be established at or near Punta Gorda, Cal. It is estimated that the work will cost \$40,000.

862. *St. George Reef, Northwest Seal Rock, seacoast of California.*—There will be found in an appendix to this volume an interesting description by Mr. A. Ballantyne, superintendent of construction of the Northwest Seal Rock Light-Station, California, of the early history, annual progress, and many incidents and facts connected with this work. There have been prepared from the office records, also, tabulated statements showing in detail the cost of its different parts. The work was commenced in 1883 and it was completed in 1891. The long time required for its construction and completion, together with the incidental expenses, were due, in a great measure, to inadequate appropriations. The stone in the structure was quarried from granite boulders found on Mad River, near Humboldt Bay, nearly 100 miles from the light-house site. These had to be dug up and broken up into suitable sizes. The larger pieces, which were used for dimension stones, were sent to the yard at the entrance to Humboldt Bay, where they were dressed. Each stone was cut by a gauge to fit the space it was to occupy in the finished structure. It was then marked with its number and a record was made of the time used in dressing it and of the name of the person by whom dressed. The stones were dressed so as to be laid with three-sixteenths inch joints. When a course of stone was dressed it was shipped to the site by the steamer, which would be moored as close as practicable to Northwest Seal Rock. Each finished stone, averaging in weight about 2½ tons, was then placed in a rope netting, attached simultaneously to the derrick on the steamer and to that on the structure, and it was thus landed. By this method of handling the stone none of them were spalled or chipped, and when the last stone of each course was slipped into place the joints on each side of it were

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found to be just three-sixteenths inch thick. The face of the pier is composed of 1,339 of these dressed dimension stones, and it is believed that no finer, more substantial, or more accurately fitting stonework can be found in the United States. The credit for this excellent work is due to Mr. David Chalmers, foreman of the stonecutters. The credit for the quarrying is due to Mr. Thomas W. Brown. The credit for the general excellence of the whole work is due to Mr. A. Ballantyne, the superintendent of construction. Each of the above named, together with nearly all the laborers employed, remained by and with the work from its beginning to its end. The work was commenced in 1883 and it was continued under the direction of Capt. A. H. Payson, late of the Corps of Engineers, U. S. Army, until the latter part of 1887. It was completed in 1891. The lens is now on its way to California, and it will probably be erected in July, 1892.*

REPAIRS.

During the fiscal year repairs and renovations, more or less extensive, were made at the following-named stations:

829. Point Fermin, Cal.	840. Point Montara, Cal.
831. Santa Barbara, Cal.	842. Bonita Point, Cal.
834. Piedras Blancas, Cal.	844. Lime Point, Cal.
837. Santa Cruz, Cal.	856. Point Reyes, Cal.
838. Año Nuevo Island, Cal.	860. Trinidad Head, Cal.
839. Pigeon Point, Cal.	861. Crescent City, Cal.

LIGHT-SHIPS.

871. *Columbia River Light-Vessel, No. 50.*—An appropriation of \$60,000 was made by the act of March 2, 1889, for building a light-vessel to mark the bar at the mouth of the Columbia River, Oregon. Plans and specifications for the vessel were prepared, and due advertisement was made for bids. But it was found on opening them, that the lowest, adding to it the cost of outfitting and supplying the vessel, exceeded the appropriation. An additional appropriation of \$10,000 having been made in the sundry civil appropriation act, approved on August 30, 1890, advertisement was made for new bids. They were opened February 24, 1891, and the contract was made on March 9, 1891, for \$60,150 with the lowest bidder. As the vessel was to be built in San Francisco, the Board directed that the work be done under the direction of the inspector of the twelfth light-house district. The orders for the steel plates, beams, and angles for the ship were placed at the East, and, at the request of the contractors, the tests of these materials were made at the manufacturers' establishments. Upon the completion of the tests and the acceptance of the steel, the material was shipped to San Francisco. Work on

* The station was lighted on the night of October 20, 1892, for the first time.

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the vessel was somewhat delayed at first by the nonarrival of material from the East, but the work was pushed with dispatch, so that when the vessel was launched she was about complete in all particulars. A fresh-water distilling apparatus was provided. The eight tanks, containing 4,000 gallons, can now be filled with two day's running of the distilling apparatus, which gives a supply of excellent water for drinking purposes and ship's use sufficient for six weeks. Two water tanks were placed in the afterhold. Six tanks are in the forehold. The light-ship was successfully launched at Potrero, San Francisco, on March 26, 1892. The vessel was then warped into the dock, and the work commenced of taking on board anchors, chains, and articles of outfit. The light-house tender *Madroño*, with fuel, rations, oil, and supplies from Yerba Buena depot, remained by the ship until her departure, stowing away the outfit and supplies, and assisting in various other ways. On Saturday, April 2, 1892, the light-ship was towed from San Francisco to Astoria, Oregon, where she arrived in good order on April 5, 1892.

DAY OR UNLIGHTED BEACONS.

The day beacons were painted and repairs were made, where necessary, by the crew of the tender. Beacon No. 7, San Diego Bay, was rebuilt, a single pile being substituted for the old four-pile beacon.

Beacons established.

Beacons Nos. 1, 3, 5, 7, and 9, Bucksport Channel, Humboldt Bay, California, on August 28, 1891.

Beacons discontinued.

Beacon No. 12, San Diego Bay, California, on August 1, 1891.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

832. *Point Conception, California.*—The 12-inch steam whistles, in duplicate, were in operation some 281 hours, and consumed about 36 tons of coal.

833. *San Luis Obispo, California.*—The 10-inch steam whistles, in duplicate, were in operation some 1,406 hours, and consumed about 82 tons of coal.

835. *Point Sur, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,317 hours, and consumed about 101 cords of wood.

838. *Año Nuevo Island, California.*—The 12-inch steam whistles, in duplicate, were in operation some 829 hours, and consumed about 53 tons of coal.

839. *Pigeon Point, California.*—This signal, consisting of one 10-inch

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and one 12-inch steam whistle, was in operation some 851 hours and consumed about 72 cords of wood.

840. *Point Montara, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,011 hours and consumed about 104 cords of wood.

841. *Farallon, California.*—The first-class steam siren, in duplicate, was in operation some 924 hours and consumed about 64 tons of coal.

842. *Bonita Point, California.*—The first-class steam siren, in duplicate, was in operation some 1,430 hours and consumed about 99 tons of coal.

844. *Lime Point, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,033 hours, and consumed about 92 tons of coal.

847. *Yerba Buena Island, California.*—The 10-inch steam whistles, in duplicate, were in operation some 146 hours, and consumed about 15 tons of coal.

850. *East Brother Island, California.*—The 12-inch steam whistle was in operation some 177 hours, and consumed about 13 tons of coal.

856. *Point Reyes, California.*—The 12-inch steam whistles, in duplicate, were in operation some 1,824 hours, and consumed about 129 tons of coal.

857. *Point Arena, California.*—The signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 975 hours, and consumed about 119 cords of wood.

859. *Humboldt, California.*—This signal, consisting of one 10-inch and one 12-inch steam whistle, was in operation some 1,177 hours, and consumed about 112 cords of wood.

862. *St. George Reef, California.*—The 12-inch steam whistles, in duplicate, have been operated some 139 hours since the time of their establishment, December 1, 1891, consuming about 13 tons of coal.

The length of time fog prevailed throughout this entire district from August to December, 1891, is without precedent. The season was unusually mild, with little or none of the strong trade winds, which usually blow every day from noon till sunset, during the summer months. Hence the fogs hung along the coast line with a peculiar tenacity. Every fog signal in the district, except that at Point Arena, was in operation a greater number of hours than during the previous year. This resulted in an increased expenditure of fuel and a consequent increase in the expenses of the tender for transportation. The signals were in operation last year some 13,520 hours on a consumption of about 596 tons of coal and 508 cords of wood, while during the previous year they were in operation some 9,958 hours, with an expenditure of about 434 tons of coal and 436 cords of wood.

Twelfth District.**BUOYAGE.**

The buoyage of this district is in excellent condition, and every buoy is in its place. A bell buoy was placed on July 22, 1891, to mark temporarily the wreck of the *Palestine*, near San Francisco Bar. The wreck was removed by blasting, on September 19 following, when the buoy was discontinued. The work was done effectively and left nothing to interfere with safe navigation. The least water now over the wreck is 10 fathoms. The Souza Rock bell buoy, near Port Harford, broke adrift in September, owing to the pennant having rusted through. The tender was sent down two days later to place a new buoy and recovered the old one. The five second-class spar buoys inside the Training Walls in San Antonio Creek, at the entrance to Oakland Harbor, were removed November 2, 1891, as they were no longer required as aids to navigation, owing to the dredging of the channel by the United States engineers. The usual channel, in fact the only channel known until within the past year, followed by vessels entering Humboldt Bay, California, bound to Eureka, was around No. 1 Buoy, up past Nos. 3, 2, and 4, by the light-house wharf, and so up to the city. A partially carried out engineering project to deepen the water on the bar by building a jetty from the south spit directly out towards the bar had so confined the ebb and flow of the tides that the north spit was being rapidly washed away and was depositing its sands in the west channel, so that it was threatening to cut off sea going vessels of even moderate draft from getting to Eureka. Those interested in the commerce of this place were alarmed. Fortunately at this time it was discovered that a new channel was being cut through across the narrow neck of sand opposite Bucksport, which has since developed into a good practicable channel, admitting vessels drawing 15 feet of water, while the old west channel at best tides had not more than 10 feet. The ultimate design of the engineering scheme for the improvement of the bar included the building of a jetty out from the north spit as well as from the south, but the north one was not to be constructed until the south was well out towards the bar. Owing to the injury to the west channel work was at once commenced on the north jetty, and the deposit of sand will probably cease.

When these jetties are both finished there is little doubt but that there will be a good depth of water, not only on the bar but all the way to Eureka. As it was probable this east or Bucksport channel would improve and become the better one of the two, it was marked on August 28, 1891, with horizontal-striped third-class nun buoys placed at each end of the channel, and five single-pile black beacons between, numbered with odd numbers successively from one to nine. Preliminary examinations were made and temporary works were erected to guide vessels in and out, as the shipping men were obliged to lighter

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their cargoes to the entrance by the west channel. As the old west channel has closed up, so far as navigation is concerned, since these new aids were established, buoys Nos. 3, 2, and 4 have been removed and discontinued. There was difficulty in keeping the two spar buoys in position on the outer edge of Humboldt Bar, owing to their exposed location almost in the breakers, but the contractor for the Humboldt buoyage replaces them promptly and recommends their retention, as mariners state that they could better dispense with all other aids in that locality than with these spars.

The Noonday Rock bell buoy went adrift on December 12, 1891, and was picked up by the tug *Monarch* 4 miles southwest of the South Farallon Island, towed to San Francisco, and delivered at the buoy depot at an expense of \$150. The *Madroño* was laid up for repairs at the time and it was therefore impossible to replace it immediately. Cautionary notices to mariners were promptly issued, and the first available day after the tender was able to raise steam the buoy was replaced 850 yards WSW. $\frac{3}{4}$ W. from the rock. This buoy was bettered by building it up one additional course higher, so that sufficient buoyancy was secured, to enable it to hold up a seven-eighths-inch chain 15 fathoms long in place of the wire pennant formerly used, where a 2-inch chain could be shackled to take the chafe of the bottom. The buoy floated higher and better than any bell buoy ever before placed in this exposed position, but in the short period of two and a half months the 2-inch chain had chafed entirely through. It was therefore found impracticable to place the buoy nearer this danger than 850 yards, on account of the pinnacle rocks surrounding it. The enlarged buoy is a great improvement over the others, and by placing it farther away from the rock, it is confidently expected that the difficulty of keeping it in position will have been overcome.

On March 17, 1892, the keeper of Point Conception light-station telegraphed that the Point Arguello whistling buoy was adrift 12 miles west of that station; the *Madroño* started south with a new buoy and on the 20th placed it in position. The old buoy was found near San Miguel Island, Santa Barbara Channel, and was recovered by the tender. The keeper of Piedras Blancas light-station telegraphed in April that the whistling buoy off his station had parted its moorings, and that he had employed men to go after it and to anchor it securely.

The tender *Madroño* was at once sent south with another buoy, which was placed in position on April 22, and the old buoy was recovered without difficulty. The Board has authorized the placing of five fourth-class spar buoys to mark the entrance to the channel known as Alviso Slough, being the head waters of the Bay of San Francisco; these buoys, with the necessary moorings, are in readiness at the depot and will be placed in position as soon as the tender can be spared for this duty, when due notice of their establishment will be given.

Twelfth District.**OTHER BUOYS IN POSITION.**

San Diego Bay.....	8
San Pedro Bay.....	2
San Luis Obispo Bay.....	2
Esteros Bay.....	4
San Simeon Bay.....	1
Halfmoon Bay.....	3
San Francisco Entrance.....	8
San Francisco Bay.....	11
San Pablo Bay.....	7
Suisun Bay.....	18
Eel River Bar.....	1
Humboldt Bay.....	9
Crescent City Harbor.....	1
Total.....	75

Buoys discontinued, no longer necessary: Oakland Harbor, five spar buoys, November 2, 1891; Humboldt Bay, buoys Nos. 3, 2, and 4, May 18, 1892.

DEPOT.

Yerba Buena Island, California.—During the past year a new water tank was built with a capacity of about 1,200 gallons and the old tank was taken down. New gear and pinion wheels were furnished the derrick. A small shed was built over the hoisting engine, used for hauling the boats up on the ways. A small barn was built back of the storehouse. All the buildings are well painted or whitewashed, and are in a good state of preservation. The coal sheds are used only for the storage of mineral oil, etc., as the fuel is now obtained by contract in San Francisco. The wharf is not in good condition, many of the piles being eaten off by the shipworm, and some of the planking needs renewing.

TENDERS.

The Madroño.—This steamer was actively employed in the buoyage of the district transporting supplies and on inspection trips. She changed or replaced 78 buoys, cleaned and painted 16, repaired and painted 8 beacons, landed 550 tons coal at 19 different stations; delivered supplies to 33 stations; conveyed the inspector to nearly all the stations in the district, making 116 inspections during the year. In doing this she steamed some 6,710 miles upon a consumption of about 770 tons bituminous coal. The crew were employed at the depot some 2,406 hours during the year, and the vessel was laid up 58 days for necessary repairs to boilers and engines. On January 21, 1892, the *Madroño* was docked and her bottom was thoroughly cleaned and painted with a mixture of red lead and white zinc, which is found to give better results than the antifouling compounds.

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Madroño's steam launch.—On January 20, 1892, a contract was made at a cost of \$2,000 for building a steam launch. Upon its completion it was subjected to thorough tests. It is of the following dimensions:

	Fe. In.
Length over all	30 6
Beam molded	7 6
Depth from top of keel to top of washboard	5 1

It is fitted with coal bunkers, water tanks, lockers, thwarts, and the like. The engine is a vertical inverted noncondenser, having a cylinder $6\frac{1}{2}$ inches diameter and 8 inches stroke of piston. The boiler is 48 inches in diameter, and 59 inches long, with flue furnace and return tubes, built to conform to the United States inspection laws to stand a working pressure of 145 pounds per square inch. With 100 pounds of steam this launch will average from $7\frac{1}{2}$ to 8 miles an hour on a consumption of about 90 pounds of bituminous coal per hour. She has a carrying capacity of from 2 to 3 tons. Her bottom was thoroughly painted, and she was furnished with awnings, side curtains and the like. This launch is used for communicating with the depot on Yerto Buena Island, for shipping supplies, and distributing fuel and supplies to the harbor stations. She has already shown herself to be of much value. She has saved much expense in transporting small quantities of supplies to the inside stations.

111

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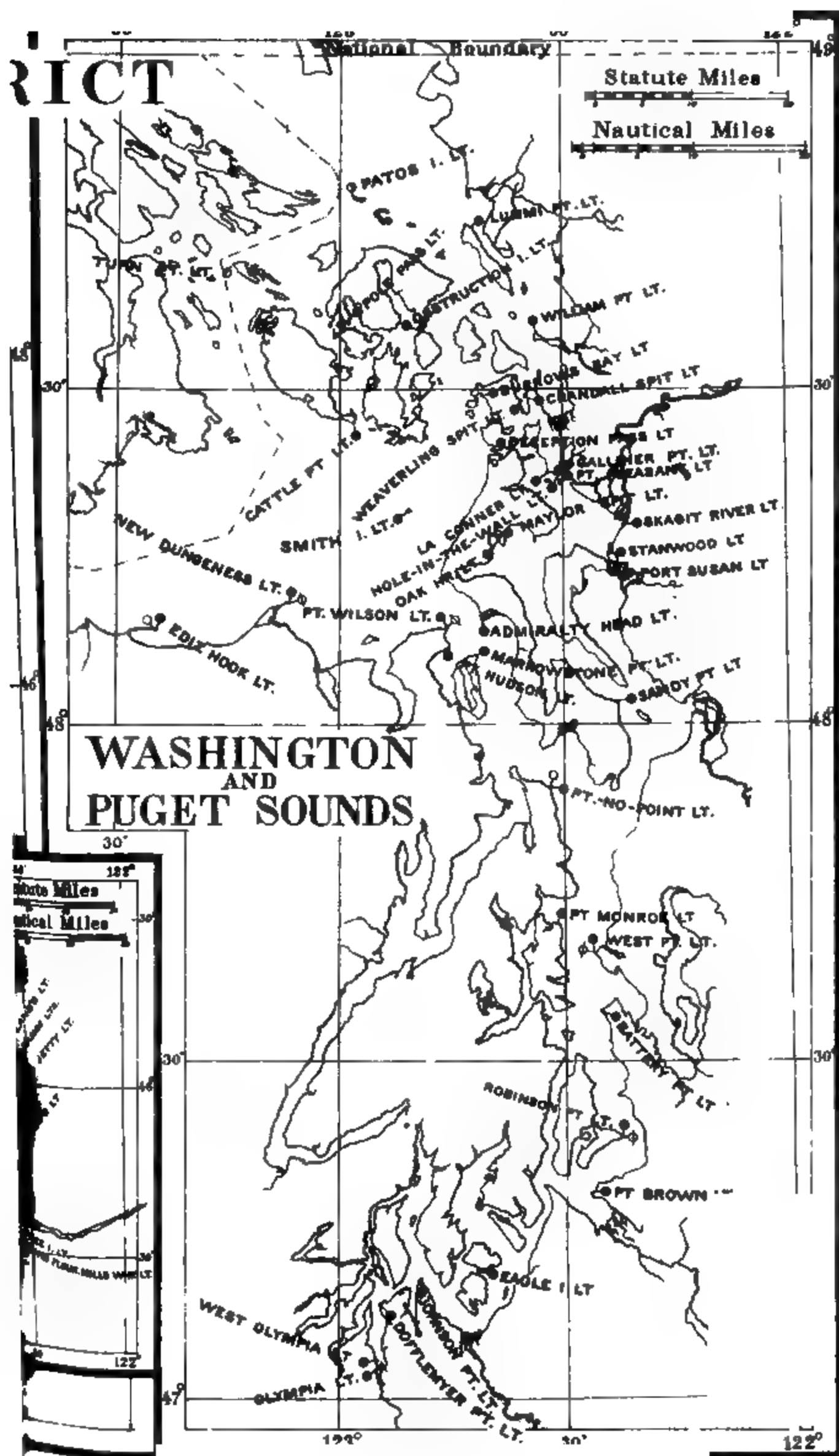
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RICT



THIRTEENTH DISTRICT.

This district extends from the southern boundary of Oregon to the boundary line between the United States and British Columbia, and embraces all the aids to navigation on the Pacific coast of Oregon and Washington, and the Columbia and Willamette rivers, Strait of Juan de Fuca, Puget Sound, and Alaskan waters.

Inspector.—Lieut. Commander William W. Rhoades, U. S. Navy.

Engineer.—Maj. Thomas H. Handbury, Corps of Engineers, U. S. Army.

There are in this district—

Light-houses and beacon lights, including 78 post lights	95
Light-ships in position	1
Day or unlighted beacons	42
Fog signals operated by steam or hot-air engines	8
Fog signals operated by clockwork	3
Whistling buoys in position	7
Bell buoys in position	3
Other buoys in position (including 30 in Alaskan waters)	223
Steamer <i>Manzanita</i> , buoy tender and for supply and inspection	1

LIGHT-HOUSES.

863. *Cape Blanco, seacoast of Oregon.*—The wagon road was put in good order by cutting out fallen timber, grading out slides, and corduroying some 300 feet of its surface. A new storage shed was built in place of the old one, and various repairs were made.

864. *Coquille River, at the mouth of Coquille River, seacoast of Oregon.*—By act of Congress approved March 3, 1891, \$50,000 were appropriated for establishing a light and fog signal at the mouth of the Coquille River. The locality was visited in September, 1891. A preliminary survey was made on the north side of the river, at its mouth, in May, 1892. The proper measures for the purchase of a site for the desired station were initiated and are now in progress.

865. *Cape Arago, seacoast of Oregon.*—A wire-rope tramway, suspended between the mainland and the island upon which the light-station is located, was completed September 13, 1891. The length of the wire cable is 400 feet and its diameter is 1 inch. It is supported by framed towers at each end, securely anchored to concrete foundations and blocks and well braced by wire guys. Upon the cable a trolley is operated by means of half-inch wire ropes passing over sheaves on each tower. Power is imparted from a winch worked by hand on the island.

866. *Umpqua River, seacoast of Oregon.*—The contract for furnishing

Thirteenth District.

the metal work for this tower was completed according to specifications on March 21, 1892. Material was transported to the mouth of the Umpqua River by the light-house tender *Manzanita*, and is now at the site of the tower. The glass for the lantern was purchased and delivered at the site. Proposals for the construction of the dwellings and the erection of the tower were again advertised for and opened August 11, 1891, the plans having been slightly modified. The lowest bid received for the erection of the tower, \$12,000, was accepted, and contract was made on October 5, 1891. The work under this contract is well advanced. The contractor has all his material on hand, all the stone cut, and concrete and rubble foundation laid. The lowest proposal received for the erection of the dwellings, etc., \$17,879, was accepted and contract was made on September 17, 1891. On February 16, 1892, notice was received from the contractors that they were unable to go on with the work. Their bondsmen were notified of this decision of the principals to this contract. The bondsmen declined to have anything further to do with the matter, on the grounds that shortly after the contract was made they had given notice that they desired to withdraw from the bond. The bondsmen were notified that they would be held responsible for all damage and loss resulting from the failure of the contractors to finish their contract. Proposals for the erection of keepers' dwellings, etc., were again advertised for and those received were opened on April 5, 1892. The lowest bid received was for \$20,250. This was accepted by the Board and contract was made April 20, 1892. Work is now progressing under this contract. The ground is nearly all graded, much of the material is at the site, and the foundation of the double dwelling is nearly completed.

867. *Heceta Head, near the mouth of Siuslaw River, between Cape Arago and Cape Foulweather, seacoast of Oregon.*—A wagon road about 7 miles long was built along the side hill from the beach south of this head to the site of the proposed station. This work was done by contract and finished on April 12, 1892. After due advertisement for proposals for the erection of keepers' dwellings, etc., metal work for the tower and the erection of the tower, those received were opened November 10, 1891. The lowest received for the metal work of the tower was \$5,000. This was accepted and contract was made. The work is now finished and delivered. The lowest proposal received for the erection of the tower was \$13,700. This proposal was accepted and contract was made January 2, 1892. The stone was cut and some preliminary work was done. The lowest bidders for the erection of the keepers' dwellings were unable to procure satisfactory bondsmen. This was also true of the next higher bidder. All bids were rejected and new ones again advertised for. The bids were opened February 11, 1892. The lowest received was for \$26,470. This being accepted, contract was made February 26, 1892. The contractors have done most of

Thirteenth District.

the required excavation, have finished the barn and the foundation for the keepers' dwellings, and have framed the needed lumber. The material is nearly all upon the ground.

— *Yaquina Bay, Oregon.*—The following recommendation, made in the Board's last two annual reports, is renewed:

Vessels now have occasion to pass in and out of the bay during the night, and lights are needed to prevent accidents. During a part of the year the mail has to be carried before daylight in the morning and after dark at night. The necessities of commerce in this locality are such as to demand the establishment of inexpensive lights at this point. It is estimated that they could be established at a cost of about \$300, and it is recommended that an appropriation of that amount be made therefor.

869. *Cape Meares, south of Tillamook Bay, seacoast of Oregon.*—The following statement made in the Board's last annual report is repeated:

A wagon road leading from this station to some public highway is now urgently needed. Several lines for this road were surveyed and the cost of construction estimated. The most convenient and practicable was selected. It is in a locality where its construction will add materially to the development of the country. This is what is locally known as the "short beach route." Leaving the station, it runs southerly along the face of the bluff next to the ocean for a distance of about 1½ miles, thence due east 4½ miles to Tillamook River. The unexpended balance on account of the appropriation for Cape Meares light-station is about \$9,000. Of this amount \$5,000 can be expended in the construction of this road, leaving the balance for other necessary work.*

870. *Tillamook Rock, 18 miles south of the entrance to the Columbia River, seacoast of Oregon.*—The telegraph cable from this rock to the main shore has not yet been laid. The light-house tender was so busily engaged during every moment of fair weather, in more important work, that her services could not be had for this work. The continuous swell about the base of the rock made it impracticable to cut a recess in which to fasten the cable, or a pipe through which to pass it. It is now proposed to extend a boom from the top of the rock about 50 feet out over the water, guy and fasten this, and pass the cable up through a sheave at the outer end of it, and from thence to proper connections on the rock. This work will be done as soon as the weather will permit and the tender can be spared for the service.

— *Willamette River Light-Station, at the mouth of the Willamette River, Oregon.*—The channel at the entrance to the Willamette River from the Columbia River is quite narrow, and vessels coming up or down the Columbia River bound into the Willamette River have at times in foggy weather great difficulty in locating the entrance. This causes much delay and great inconvenience to the regular passenger and freight steamers. A light and fog signal at the mouth of the Willamette River would be of great service to the commerce of that river. It is

*Authority was given by an item in the sundry civil appropriation act approved on August 5, 1892, to use \$5,000 of this unexpended balance for the construction of this road. The work will be done as soon as practicable.

Thirteenth District.

estimated that these could be placed for not exceeding \$6,000, and it is recommended that an appropriation of this amount be made therefor.

921. *Cape Disappointment, seacoast of Washington.*—The picket fence around the dwelling was entirely renewed and various repairs were made.

The following recommendation, which was made in the Board's last three annual reports, is renewed:

The present light at Cape Disappointment is inadequate for the purposes of commerce and navigation. It is believed that if North Head is marked by a first-order light, and the proposed light-stations at Grays Harbor and Destruction Island are completed, that the Pacific coast will be well supplied with lights of the first order from Cape Flattery to Tillamook Rock. Proper measures should be taken for the establishment of a first-order light at North Head. This, it is estimated, will cost \$50,000. It is recommended, therefore, that this sum be appropriated for this purpose. When this light is established, the first-order light at Cape Disappointment will no longer be necessary, and it is proposed to then reduce it to a light of the fourth order. It will then be of sufficient power to benefit vessels close to the bar outside and vessels in the Columbia River.

922. *Willapa Bay (Shoalwater Bay), seacoast of Washington.*—New cedar posts were set in the reservation boundary fence. The foundation of the bulkhead inclosing the tower and dwelling was protected by placing around it brush mats to prevent the wind from cutting the sand away. The foundation of the oil house was repaired and various other repairs were made.

— *Grays Harbor, seacoast of Washington.*—The following recommendation, made in the annual reports of the Board for the last five years, is renewed:

By the act approved July 7, 1884, Congress appropriated \$15,500 for the establishment of a light at this place. While the negotiations for the purchase of a site for the light thus authorized were being carried on, the inadequacy of the small harbor light it was proposed to erect to meet the demands of the commerce and navigation of this part of the Pacific coast became apparent, together with the necessity for the establishment of a first-order coast light about 4 miles north of the site selected for a harbor light. This matter was considered by the Board at its session held on February 3, 1886, when it was ordered that the proper steps be taken to have \$60,000 added to the existing appropriation, to enable the Board to erect a first-order light about 4 miles north of the site selected at Point Brown for the Grays Harbor light. The Board therefore recommends that an appropriation of \$60,000 be made for the establishment of a first-order light instead of for a harbor light as originally intended, and that the \$15,500 appropriated by the act of July 7, 1884, be made applicable to the same purpose.

923. *Destruction Island, seacoast of Washington.*—The defective work done by the contractors for the erection of the keepers' dwellings, etc., at this station, mentioned in the last annual report, was all remedied or replaced by good work, as required by the specifications of this contract, and was paid for from the retained percentage. The contractor for the erection of the tower completed his work in a satisfactory manner

Thirteenth District.

on November 12, 1891. The lens and lamps were put in place and everything was made ready for exhibiting the light November 24, 1891. The fog signal was put into operation on November 1, 1891, and the light was exhibited continuously on and after January 1, 1892.

924. *Cape Flattery, on Tatoosh Island, entrance to the Strait of Juan de Fuca, Washington.*—A new hoisting derrick for landing supplies was erected on the bluff above the beach where the boats land. It is operated by a hoisting engine. This engine also operates the tram cars on the top of the bluff and on the beach. A return-tubular boiler was purchased under contract and delivered by the light-house tender on the island. A small engine, with governor, valves, etc., and a suitable piece of machinery for operating a fog whistle were purchased. The brick, cement, lime, and lumber to set the boiler were purchased last year. It is now proposed to make the duplicate whistle available in place of the old one, which may break down at any time.

The following recommendation, made in the Board's last four annual reports, is renewed:

It was decided that the location of the fog signal ought to be changed to West Island, as it could be heard from the latter point much more distinctly by passing vessels. This change of location, it is estimated, will cost \$17,000, and it is recommended that appropriation be made accordingly.

925. *Ediz Hook, Strait of Juan de Fuca, Washington.*—The boathouse was moved back 15 feet and the boatways were extended and repaired. The high board fence in the rear and the picket fences in front of the dwelling were renewed. The assistant keepers' quarters were put in good order. The occupation of a portion of this reservation by the Port Angeles Mill and Lumber Company was considered. The United States attorney for the district of Washington was directed to take the necessary legal measures to have these trespassers removed, but up to the end of the year they still illegally occupied a portion of this reservation.

927. *Smith Island, entrance to Admiralty Inlet, Washington.*—An oil house of galvanized iron, with concrete floor, was built. Various repairs were made. The beacon on the sand spit having been washed away, it was replaced by one built of concrete, measuring 10 feet square at the base, 4 feet square at the top, and 12 feet high. A cedar pole 9 inches in diameter and 16 feet long was set down in this concrete 4 feet and surmounted with a barrel, which is painted, the upper half black and the lower half white.

928. *Admiralty Head, entrance to the inlet, Washington.*—The old boathouse was rebuilt, 75 feet were added to the length of the boatways, and a new boat car was built. Various repairs were made.

929. *Point Wilson, Admiralty Inlet, Washington.*—A boundary fence was built and needed repairs were made. The light at this station is to be changed to fixed white with red flashes at intervals of twenty

Thirteenth District.

seconds. This change is to be made when the illuminating apparatus, which has been ordered, is received from abroad.

931. *Marrowstone Point Post Light, Admiralty Inlet, Puget Sound, Washington.*—A large fog bell here would be of great service to the commerce of these waters. It would mark the sharp turn in the course entering or leaving Puget Sound. In case appropriation is made to replace the bell now at Point No Point with a first-class fog signal, the bell taken from there can be established at Marrowstone Point. It is estimated that the bell can be set up and that the necessary buildings for the accommodation of the keeper can be erected for \$3,500. It is recommended that this amount be appropriated therefor.

932. *Point No Point, Puget Sound, Washington.*—A new wooden bulkhead 480 feet long by 12 feet high, supported by 200 cubic yards of riprap, was built on the west side of the station to protect it from the high seas. The grounds were refilled and graded, new walks were laid, and various other minor repairs were made. The boatways were rebuilt. It appears that the present fog bell at Point No Point does not satisfy the needs of the service. It is recommended, therefore, that a first-class fog signal be installed in place of the bell. It is estimated that this can be done for \$6,000, and it is hoped that the general appropriation for fog signals will be sufficiently large to enable the Board to pay this amount therefrom.

934. *West Point, Puget Sound, Washington.*—Some 275 tons of rock were delivered in place on the north side of the bulkhead near the tower, to protect the spit and ground from being washed away by the high seas.

— *Post lights in Puget Sound and its tributary or adjacent waters, Washington.*—The following recommendations, which were made in the annual reports of the Board for the last two years, are renewed:

The post lights in the Columbia and Willamette rivers, in Puget Sound, and in adjacent waters are of great benefit to navigation, and night boats now run regularly on the Columbia and Willamette rivers. They are of much use during fog, as the lights can be seen, except in very dense fogs, at a distance of 100 yards or more, and the pilots rely on the lights for a new departure. Without their aid night boats could not run regularly. The demand for these lights on Puget Sound and its tributary rivers is increasing with the growing commerce. The Board recommends, therefore, the establishment of thirty post lights along the navigable channels of the Snohomish River, the Skagit River, the Nooksack River, and the La Connor Slough, and along such other channels of Puget Sound and the rivers tributary thereto, in the State of Washington, as may be necessary to meet the requirements of commerce. It is estimated that they can be built and maintained for a year for a sum not exceeding \$10,000. It is therefore recommended that an appropriation of this amount be made.

962. *Turn Point, west end of Stuart Island, Canal de Haro, Washington.*—By act of Congress approved March 3, 1891, \$15,000 were appropriated for establishing a light and fog signal at this point. It is pro-

Thirteenth District.

posed to place a fixed white lens lantern near the end of the point upon a tripod platform about 10 or 12 feet above the ground. This will be plainly visible in fair weather from all adjacent shores and for a distance of at least 7 miles up and down the main channel. The station will be supplied with a Daboll trumpet fog signal. A survey of the ground was made, plans and specifications for the buildings necessary to the station have been prepared, and all work preliminary to advertising for bids for building them has been done.

963. *Patos Island, entrance to Canal de Haro, Washington.*—By act of Congress approved March 3, 1891, \$12,000 were appropriated for establishing a light and fog signal upon this island. It is proposed to place on its west end a fixed red lens lantern upon a tripod platform 10 or 12 feet above the ground. This is deemed necessary, not so much to mark the general locality, which is done by the white light on the British shore opposite, as to aid in locating the fog signal when vessels are close to the shore in foggy weather. The station will be supplied with a Daboll trumpet fog signal. A survey of the ground was made, plans and specifications for the buildings necessary to the station have been prepared, and all work preliminary to advertising for bids for building these at the station has been done.

— *Mary Island Light-Station, Alaska.*—A custom-house has been established here; hence many vessels are obliged to make this a place of call. A small, inexpensive light, say a lens-lantern beacon, would assist vessels to make the port at night and hold on. The beacon could be kept by one of the custom-house employés. It is estimated that it could be established and maintained a year for \$800, and it is recommended that an appropriation of that amount be made for this purpose.

POST LIGHTS.

With very few exceptions the keepers performed their duties well and the lights were efficiently maintained. Petitions are frequently received to establish more lights on Puget Sound and adjacent waters, Columbia and Willamette rivers, and at other points in this district, where they have been recommended by the district officers, but the funds available do not permit it to be done. These lights are very efficient aids to the navigation of the inland waters of this district, and more should be established as soon as funds can be made available for the purpose. Supplies were delivered to all the lights, the posts and beacons renovated and replaced, and all other work done by the crew of the *Manzanita*.

REPAIRS.

Repairs were made at the following-named stations:

868. Cape Foulweather, Oregon.
869. Cape Meares, Oregon.

926. New Dungeness, Washington.
936. Robinson Point, Washington.

Thirteenth District.**LIGHT-SHIP.**

871. *Columbia River Light-Vessel, off the Columbia River Bar.*—This vessel was received in this district April 5, 1892, and as soon as ready (April 11, 1892) was towed out to her station by the tender *Manzanita* and anchored in position with one 5,000-pound mushroom anchor and 150 fathoms of 2-inch chain. She has been on the station now nearly three months, and everything works satisfactorily. During the latter part of April and the first part of May she encountered several very heavy gales from south to southwest and rode them out very comfortably, with 180 fathoms to the water edge.

DAY OR UNLIGHTED BEACONS.

The following-named beacons were established in Alaskan waters:

Cutter Rocks, Kerillagigedo Channel.—Iron spindle, 20 feet high, surmounted with a barrel painted black and white horizontal stripes.

Rosa Reef, Nichols Passage.—Iron spindle surmounted with a barrel, painted black and white horizontal stripes.

Lincoln Rock, Clarence Strait.—Iron spindle 20 feet high, surmounted with a barrel painted black and white horizontal stripes.

Vanderbilt Reef, Lynn Canal.—Iron spindle 20 feet high, surmounted with a barrel painted black and white horizontal stripes.

Hanus Reef, Icy Straits.—Iron spindle 20 feet high, surmounted with a barrel painted black and white horizontal stripes.

Killisnoo Harbor, Chatham Strait.—East beacon 20 feet high, painted white.

East Beacon on the Eckholms, entrance to Sitka Harbor.—Pyramid 20 feet high, built of logs, painted white, with center pole surmounted with a star, with the letter E in black on sea face of beacon.

West Beacon on Makhnati Island, entrance to Sitka Harbor.—Pyramid 20 feet high, built of logs, painted white.

Sergius Point, Sergius Channel.—Beacon 20 feet high, painted white.

FOG SIGNALS OPERATED BY STEAM OR HOT-AIR ENGINES.

870. *Tillamook Rock, Oregon.*—This first-class steam siren, in duplicate, was in operation about 189 hours, and consumed about 12 tons of coal.

871. *Columbia River Light-Vessel, No. 50.*—This 12-inch steam whistle was in operation, since April, 1892, 31 hours, and consumed about a ton and a half of coal.

923. *Destruction Island, Washington.*—This first-class steam siren, in duplicate, was in operation about 224 hours and consumed about 16 tons of coal.

924. *Cape Flattery, Washington.*—This 12-inch steam whistle was in operation about 449 hours and consumed about 27 tons of coal and 37 feet of wood.

Thirteenth District.

926. *New Dungeness, Washington.*—This 12-inch steam whistle was in operation about 207 hours and consumed about 14 tons of coal and 256 feet of wood.

929. *Point Wilson, Washington.*—This 12-inch steam whistle was in operation about 178 hours and consumed about 18 tons of coal and 88 feet of wood.

934. *West Point, Washington.*—This Daboll trumpet was in operation about 129 hours and consumed about a ton and a quarter of coal and 52 feet of wood.

936. *Robinson Point, Washington.*—This 12-inch steam whistle was in operation about 119 hours and consumed about 13 tons of coal.

BUOYAGE.

The buoyage in this district is in good condition. Owing to the large number of buoys to be maintained in position, the time lost with bar-bound harbors, heavy westerly swells, and shifting channels, it was impossible for one tender to change all the buoys every six months, as required by the regulations, besides attending to the other work of inspection, supply, construction, and repair. During the year two whistling buoys went adrift. One was recovered and the other is on the beach, where it can be recovered at some favorable time. Nearly all the buoys, including those in Alaskan waters, were changed, painted, and replaced, and during the month of June, 1892, sixteen new buoys were established in southeastern Alaska.

DEPOT.

Tongue Point, Columbia River, Oregon.—The keeper's dwelling and grounds are in good order and condition. The supply building and coal shed are in good repair. The tops of many of the piles, caps, joists, string pieces, and planking are rotten and gone in many places. The wharf is too small for the present needs and should be enlarged and extended out to the channel.*

TENDERS.

The Manzanita.—This tender is in very fair condition and was constantly employed landing, at the different stations, supplies and fuel,

* By the sundry civil appropriation act which was approved March 3, 1891, an appropriation of \$15,000 was made for removing the buoy and supply depot, now at Tongue Point, to Astoria, Oregon, and for the purchase of a site at the latter place and the construction thereon of a suitable wharf for the use of the Light-House Establishment. It was found, however, that, during the time which had elapsed between the date when the Board had recommended this removal and the date when Congress made the appropriation, the necessity for the removal had passed. It was therefore recommended that the Board be authorized to apply the \$15,000 appropriated for this purpose to the extension of the present site and to putting the structures on it and its wharf into proper repair. This was done by an item in the sundry civil appropriation act which was approved on August 5, 1892. The work thus authorized will be done as soon as practicable.

Thirteenth District.

transporting mechanics and material for repairs and construction at isolated stations, working the buoys, attending to the post lights, and making inspections. During the year she conveyed the inspector each quarter to the different light-stations on inspection duty, established 25 buoys, replaced, changed, etc., 203 buoys, and painted 305 buoys; also established, replaced, and renovated 38 beacons, established 5 spindles, landed at the different stations 144 tons of coal, rations, and fuel for the keepers, and the crew did 60 days' work at the depot. In doing her work she steamed 14,369 miles and consumed 983½ tons of coal.

The Columbine.—This steel screw steamer was built by contract at Cleveland, Ohio, in 1891 and 1892, for use as a tender in this district.*

* She was sent through the Canadian canals and the St. Lawrence River and around the Atlantic seacoast to New York, where she was delivered on September, 1892, by the contractors to the Government. In coming around she showed herself to be an excellent sea boat and to have greater speed even than was demanded of the contractors. Her length over all is 155 feet, breadth, 26½ feet, depth, 15 feet 2 inches. Her net tonnage is 212.07. She has a double bottom and a false keel, two decks, and two masts. Her engine and boilers are of the best kind. She was thoroughly fitted out at general light-house depot, at Staten Island, New York, and on October 30, 1892, sailed for Portland, Oregon, via the Straits of Magellan, under the charge of Lieut. Commander C. H. West, U. S. N.

FOURTEENTH DISTRICT.

The fourteenth district extends, on the Ohio River, from Pittsburg, Pa., to Cairo, Ill., 966 miles; on the Tennessee River, 255½ miles; and on the Great Kanawha, 73½ miles; in all, a distance of 1,295 miles, and embraces all the aids to navigation within these limits.

Inspector.—Commander Charles McGregor, U. S. Navy, to August 1, 1891; Lieut. Col. William E. Merrill, Corps of Engineers, U. S. Army, to August 13, 1891; Commander Edwin M. Shepard, U. S. Navy, from August 13, 1891.

Engineer.—Lieut. Col. William E. Merrill, Corps of Engineers, U. S. Army, to December 14, 1891; Maj. Amos Stickney, Corps of Engineers, U. S. Army, from January 30, 1892.

Commander Shepard assumed the duties of inspector of this district, relieving Lieut. Col. W. E. Merrill, U. S. Army, on August 13, 1891, Col. Merrill having been in charge since the death of Commander Charles McGregor, U. S. Navy, on August 1, 1891.

An inspection trip was commenced on September 12, and the lights were supplied as far as Point Pleasant, W. Va., on the Ohio, and on the Kanawha as far as the head of Knob Shoals, where, finding the water too low for the tender *Goldenrod* to navigate, the trip was abandoned, and she returned to Cincinnati, arriving there on September 24. The number of the crew was reduced while awaiting favorable water. The water serving on November 19, 1891, the inspector proceeded to inspect and supply all the lights not attended on the previous trip, which work was accomplished December 24, 1891.

In March and April the whole district was inspected and supplied and in cases where the posts were not under water they were painted and left in good order. Supplies sufficient to last until November were furnished each keeper, so that in case of a drought no inconvenience need arise from want of supplies.

The lower river is high, and when it subsides to a low water stage there will probably be a shifting of lights necessary.

The light-keepers have done their duty fairly well, considering that in many cases they have had to contend with high water, strong current and winds, driftwood, and the like.

Complaint was made by a number of keepers that their lights were interfered with by unknown parties. These depredations the inspector endeavors to check, with the coöperation of the district attorneys, whenever the culprits can be apprehended.

Fourteenth District.

There are in the district—

Post lights.....	494
Floating lights	33
Light-keepers.....	486
Number of post lights discontinued during the year	2
Number of post lights established during the year	2
Number of floating lights discontinued during the year	2
Number of floating lights established during the year.....	0
Steamer <i>Goldenrod</i> , for supply and inspection	1

TENDERS.

The Goldenrod.—During the year this steamer was hauled out on the marine railway at Cincinnati, her hull scraped thoroughly, and painted inside and out. The bottom was found to be pitted somewhat, but the only repairs deemed necessary were the replacing of a score or more of rivets and one new hog-chain brace. The old capstan engine was almost useless, owing to its construction, being liable to hang on a center; it was replaced by a double-acting one, capable and reliable. Owing to this change the coal bunker was considerably enlarged.

A Monitor injector was placed on board, which works successfully and is a standby in case the doctor engine is disabled.

A steam-heating apparatus was installed, which works well, lessens the chances of fire, and economizes fuel.

A patent balanced steamboat stage was placed on board, which will save time and labor in making the numerous landings on inspection trips.

The tender has steamed some 6,000 miles, consumed about 532 tons of coal, and distributed about 16,319 gallons of oil.

There have been—

Trees cut	796
Acres of brush and willow cut.....	7½
40-foot masts placed	4
Posts reset.....	20

FIFTEENTH DISTRICT.

The fifteenth district extends on the Mississippi River from the head of navigation to Cairo, Ill., on the Missouri River to Kansas City, Mo., and on the Illinois River from La Salle to its mouth, being in all a distance of 1,582½ miles, and embraces all the aids to navigation within these limits.

Inspector.—Commander William C. Wise, U. S. Navy.

Engineer.—Lieut. Col. Charles R. Suter, Corps of Engineers, U. S. Army.

In this district there are—

Number of lights	501
Steamer <i>Lily</i> , for supply and transportation.....	1

The stations were regularly inspected and kept in good order. The lights are well spoken of by pilots and representatives of river interests. The keepers were faithful and efficient.

The extraordinary high water inundating the country this spring interfered somewhat with the work of the district. A number of stations with outfits were carried away, but under trying surroundings and, in many cases, dangerous circumstances the keepers performed their duty.

The commerce of the Missouri and Illinois rivers remains practically the same as reported last year. No increase of commerce makes additional lights necessary. The improvement of the Missouri is still problematical. The ice and floods have apparently destroyed what was attempted.

The lights on the Mississippi River continue to give satisfaction. The number is being gradually increased in answer to the constant demands for them made by those interested in river commerce.

More lights are shown than are reported, for during low water many temporary floating lights are shown to mark wrecks, crossings, reefs, etc., which are withdrawn when the water rises.

On the Upper Mississippi, where the lumber interest is powerful, the dangerous and illegal practice of "log driving" still continues to block the channel for many miles, rendering the navigation dangerous. On his last inspection and supply trip the light-house inspector was unable, because of this, to visit a number of stations, even by small boat.

TENDER.

The Lily.—This steamer made 16 inspection and supply trips, steamed some 7,700 miles, consuming about 1,773 tons of coal and 3½ cords of wood. Each year's service adds to her draft of water. At present she

Fifteenth District.

needs 4 feet of water in the channel, whereas for efficient work at all stages not more than 30 inches should be her greatest draft. Her present wooden hull is fast deteriorating, but her upper works are in good condition. The engines are in a fair state of efficiency. A new donkey boiler has replaced the old tubular boiler, and it gives satisfaction.

RECAPITULATION.

Number of lights in district	501
Number of keepers of lights	320
Number of channel marks	88
Number of trees cut	1,684
Number of acres of land cleared	12½
Number of gallons of oil used	12,481

SIXTEENTH DISTRICT.

The sixteenth district extends on the Mississippi River from Cairo, Ill., to New Orleans, La., and on the Red River a distance of 8 miles, being in all a distance of 1009 miles, and embraces all the aids to navigation within these limits.

Inspector.—Lieut. Commander Robert M. Berry, U. S. Navy.

Engineer.—Lieut. Col. Charles R. Suter, Corps of Engineers, U. S. Army.

In this district there are—

Post lights.....	341
Steamer <i>Joseph Henry</i> , for supply and inspection.....	1

There are in the sixteenth district 341 post lights, cared for by 327 keepers, an increase of 3 lights and 4 keepers in the past twelve months. The post lights are separated by an average distance of less than 3 miles. Notwithstanding this fact there is a constant demand for more lights. This comes from masters and pilots of river craft, and the demand is backed by petitions from leading steamboat and barge lines. They claim that the thorough lighting of the river banks at night facilitates traffic to a greater extent than any other aid with which they can be furnished. The post lights and their outfits are in good condition, and the keepers have rendered efficient service. The district was recently provided with 100 new brass lanterns of improved pattern to replace the older lanterns now in use on the lower river and at other places, where the danger of loss by caving banks will be at the minimum. The present aggregate monthly pay roll of keepers is \$3,075, an average of \$9.02 per month per post light. The average was \$9.09 on July 1, 1891. An inspection of the lights of the entire district was made during each quarter. In addition to these, a short patrol trip was made early in January, 1892. The following is a statement of the work done during the year:

Post lights inspected, paid, and supplied	1, 366
Post lights established	34
Post lights discontinued	31
Post lights moved.....	154
Keepers discharged	1, 103
Keepers appointed	101
Trees over 4 inches in diameter felled	1, 225
Acres of willows, brush, etc., cleared	14½

TENDER.

The Joseph Henry.—Three new steel fire plates were put in the boilers and the old after mud-drum was replaced with a new one. No repairs were made on the hull or cabin. With new smokestack inside bulk-

Sixteenth District.

heads for wheel houses, and the renewal of part of the nosing on the main deck, all of which have been provided for, and are now under way, the *Joseph Henry* only requires the painting of the inside of the cabin, staterooms, and texas, to render her condition fairly satisfactory. During the year the *Joseph Henry* steamed some 8,554 miles, consuming in doing so about 1,065 tons of coal. The office work of this district consisted of the keeping of the accounts of 372 post lights, including the 31 post lights discontinued during the year, and the maintenance of usual routine and official correspondence.

CONCLUSION.

In concluding this report, the Board takes pleasure in stating that each of the sixteen light-house districts into which the establishment is divided is in good working condition.

All of which is respectfully submitted.

JAS. A. GREER,

Rear-Admiral, U. S. Navy, Chairman.

GEO. W. COFFIN,

Commander, U. S. Navy, Naval Secretary.

F. A. MAHAN,

Captain of Engineers, U. S. Army, Engineer Secretary.

The SECRETARY OF THE TREASURY.

REPORT OF THE LIGHT-HOUSE BOARD, 1892.

APPENDIX No. 1.

RELATIVE TO THE TWIN SCREW TENDER MAPLE NOW BEING
BUILT BY THE LIGHT-HOUSE ESTABLISHMENT.

THE MAPLE.

MATERIAL OF HULL.

The material, to be open-hearth mild steel, shall stand satisfactorily the tests adopted by the Light-House Board and specified in detail hereinafter.

DIMENSIONS.

	Ft.	In.
Length over all	164	0
Length from inside rudderpost to inside stem.....	155	0
Beam molded	30	0
Depth of hold from top of beam to top of keel-plate.....	11	10

GENERAL DESCRIPTION.

The vessel will be built with a double bottom, constructed as per plan and specification, extending from frame No. 53 to frame No. 65. This double bottom will be divided into two separate water-tight and independent compartments, each provided with a sufficient number of manholes properly constructed and so located that access can be had at all times to both compartments for cleaning and other purposes. The detailed description of the construction of the double bottom will be found under its proper head, the different compartments to be tested with a hydrostatic pressure, not less than that corresponding to a head of water of 15 feet. There will be seven water-tight bulkheads dividing the parts of the vessel above, and forward, and abaft the double bottom, into eight water-tight compartments. All water-tight compartments in any part of the vessel to be provided with effective appliances for draining and emptying, also for sounding and for the escape of air. The vessel will be built with a flat-plate keel in double thicknesses, provided with one outside bilge-keel on each side of the vessel, constructed as shown, and extending for about 75 feet. The run of these keels shall conform with the natural run of the water when the vessel is in motion. The plating will be run in inside and outside strakes, perfectly fair, and the shell-plating shall be neatly and smoothly fitted up and riveted. All plates in the shell of the vessel, the keels, the bulkheads, the bulwarks, and wherever directed by the superintendent in charge, shall be machine planed; no other method of fairing the strakes or preparing edges for calking will be allowed.

Under the main deck will be located storeroom, trimming tank, lower quarters aft, fitted with ten berths; three staterooms, pantry, lockers, table, etc. Forward of these quarters and in the succession named will be located the engine room, extending to the superstructure deck; the boiler rooms, the coal bunkers, the cargo hold, trimming tanks, crew space with twelve berths, lockers, wardrobes, wash-stands, table, etc., chain lockers, and the forepeak, which will be fitted up as a storeroom. The main-deck house will be constructed as shown on plans, and extend from about frame No. 4 to about frame No. 53, and in it will be located inspectors' quarters, consisting of cabin, two staterooms provided with iron bedsteads, one pantry, and one bath room, every room fitted complete; two staterooms for two quartermasters and for cook and steward, entrances to upper deck and lower quarters aft, engine room, donkey boiler room, water-closets for crew, and bath room for officers, crew's wash

room, the upper boiler room, galley, room for steam steering engine, lamp room, and ice room, two hoisting engines, located as shown. Cargo hatch, necessary cleats, fairleads, bitts, ringbolts, freeing ports, scuppers, anchor beds, anchor windlass, and all other small fittings needed for the proper handling of the vessel, cargo, buoys, boats, anchors, etc., will be located and fastened as shown, and as will be directed by the superintendent in charge, whose decision in such matters shall be final. On the superstructure deck aft will be located a deck house with chart room fitted as a stateroom, with bureau, desk, iron bedstead, etc., and entrance from main deck, also a forward house with pilot house and staterooms for master and chief engineer, as shown. This superstructure deck will be surrounded by a strong and neatly-built rail of galvanized-iron piping. On this deck will be located three boats, necessary ringbolts, bitts, chocks, fairleads, lead box, cleats for fenders, for fastening, and for all other purposes required by the service. Two hard-wood stairs will lead to the forward deck and one to the deck aft.

The vessel will be rigged as a two-masted schooner, as shown on the plans and as will hereinafter be described and specified.

DOUBLE BOTTOM.

The vessel will be fitted with a double bottom, extending from frame No. 53 to frame No. 65, constructed as shown on plans. Inside height of this double bottom, in the clear between plates amidships, will be about 36 inches. The vertical center keel plate will run from end to end of the double bottom and will be tapered forward of frame 65 to the height of the keelson, and it will form the center keelson for the length of the double bottom. The frames in the double bottom will be run continuously from center to the height given under the heading "frames." The reverse bars shall be cut between the girders and at the margin plate, where they will be dispensed with for a sufficient distance to allow the margin plate to be properly worked in, and to make the double bottom water-tight at the sides or bilges. As a compensation for the cutting of the reverse frames at the side, there shall be put in doubling frames, same size as the ordinary frames, riveted back to back to frames proper. The lower and upper angles connecting the vertical keel plate and side girders to inner skin and floor plates shall be continuous. The reverse bars in clips between the girders are to be secured thereto by means of small plate knees large enough to take three rivets on each side, and they are to be strengthened by vertical angles where, in the opinion of the superintendent in charge of the work, it may be deemed necessary. The plans, together with the specifications, shall govern the construction of the double bottom, and two ballast compartments shall be formed of same, as shown on plans.

BALLAST TANK AFT.

Beams in ballast tank to be angle steel, 3 by 2½ by ½ inches, fitted to each frame and secured thereto by knee-brackets of proper size and thickness. Plating at center to weigh 10 pounds per square foot, reduced at sides to 8 pounds. Round wrought-iron manholes with water-tight cover to be fitted as shown on plans. All trimming tanks to be thoroughly water-tight, and tested by hydrostatic pressure not less than that corresponding to a head of water of 15 feet, and to the satisfaction of the superintendent in charge of the work.

BULKHEADS.

The bulkheads to be arranged as per plan, to be built thoroughly water-tight, and to be tested by a hydrostatic pressure not less than that corresponding to a head of water of 15 feet from the bottom of the keel. The bulkheads shall be fitted with patent radiating stiffeners, the distance between the stiffeners decreasing toward the bottom, and also toward the center line of the vessel. The plates shall therefore not

be increased in thickness in the lower part of the bulkhead, but be of a uniform thickness of 9 pounds per square foot. The stiffeners shall be in size equal to the frames.

Double frames shall be fitted at all the water-tight bulkheads, and both edges of both frames shall be planed for calking. To prepare such edges by chipping after fitting of the shell-plating will not be allowed. The whole shall be made thoroughly water-tight by calking only, except in such places where, in the opinion of the superintendent in charge, hempen stop-waters, dipped in red lead, may be used as an extra precaution. Seams of plating to run horizontally, the plates to be lap-jointed, planed, and calked water-tight. Around keelsons and stringers will be fitted shoes of angles strictly conforming with the shape of angles, corners, etc., on one side and a plate on the other. Liners for the outside strakes at water-tight bulkheads shall extend from the frame forward to the frame abaft the bulkheads; they shall be planed, fitted tight, and be calked. Suitable sluice valves to be fitted on all water-tight bulkheads, and to be worked from the upper deck. Liners and stiffeners to be put in where necessary. The coal-bunker bulkheads to be built as per plan, the plates to weigh 7 pounds per square foot. It is the intention that the bulkheads and all water-tight compartments in the vessel shall be tight against the pressure specified, and that the bulkheads shall be built strong enough to withstand any pressure due to the complete filling of any room or compartment below main deck. Care shall therefore be taken that such a result will be obtained and tests will be made by the representative of the Light-House Board to such an extent as will satisfy him that the intention of the contract has been fulfilled.

LOWER CABIN AFT.

Will be fitted with ten beds with drawers underneath, beds and drawers to be constructed of pipes, tees, elbows, and wire netting, as per plan; four air ports 10 inches in diameter will be fitted on each side with storm covers of cast iron working on hinges; necessary shelves, hooks, etc., to be fitted where required; all wood-work white pine; doors in staterooms to be arranged in panels; all locks and fittings for doors, drawers under beds, etc., to be of brass. The entrance to these quarters will be from main deck on starboard side in engine room, as shown, and will be built perfectly water-tight into the water-tight bulkhead; lockers to be fitted as shown and as will be directed.

CREW SPACE.

The crew space will be located as per drawing, and will be fitted with berths for 12 men, constructed of pipes, tees, elbows, and wire netting; under each of the lower berths there will be two drawers of wire, fitted with lock and keys of brass; six wardrobes will be built as shown, 15 inches in clear above deck, and a table having an ash top and sufficiently large to seat 12 men will be furnished. This table will be made to slide up on stanchions and properly fastened underneath deck beams when not in use; necessary clothes hooks to be provided; special care to be taken to provide proper ventilation and good light. Draining holes to be cut in the flooring where directed. There will be four air ports on each side, of metal, and 10 inches in diameter in clear, with rubber packing and cast-iron storm covers working on hinges. To each bed will be furnished one mattress, one pillow with cover, one mattress cover, two cotton sheets, and two blankets. The crewspace will also be provided with good substantial outfit of crockery, cutlery, glass and table ware complete for 12 men; also fourteen wooden stools.

EQUIPMENT AND OUTFIT.

Steam-steering gear.—The vessel shall have a steam-steering gear of the Globe pattern; the engine shall be fitted complete with drum; hand-steering and steam-steering wheels of proper size and neat finish; all chains, wire ropes, blocks, and fair-

leads shall be supplied and fitted; the whole shall be arranged in the most convenient manner ready for actual use for steering by hand or by steam, and to the satisfaction of the representative of the Light-House Board.

Anchors and chains.—The following anchors will be supplied by the contractor: One bow anchor, 1,600 pounds; one bow anchor, 1,400 pounds; one stream anchor, 500 pounds; all with iron stocks; also 90 fathoms $1\frac{1}{2}$ -inch stud chain, and 75 fathoms $1\frac{1}{2}$ -inch stud chain; necessary chocks, etc., to be made and fastened in their proper place. The chains shall stand in every respect and satisfactorily Lloyd's tests.

Hoisting engines.—The contractor shall furnish and fasten in places indicated on plans one double $10\frac{1}{4}$ -inch cylinder steam-hoisting engine, of Copeland & Bacon's New York, pattern, and one single 6-inch cylinder hoister of the same make.

The hoisters shall be leaded under and strongly fastened to deck and deck beams. They shall be provided and fitted with all valves, pipes, connections, etc., necessary in actual service, to the satisfaction of the representative of the Light-House Board.

DRAWINGS.

The contractor will furnish the Light-House Board with a complete set of drawings or tracings (no blueprints will be accepted, except in such cases where, in the opinion of the Light-House Board, a blueprint would fully answer the purpose) of all parts of the hull, machinery, pumps, rigging, and general arrangements of same as assembled in the vessel and as actually constructed; also weights of boilers, engines, pumps, shafting, propellers, etc., where possible to be given in detail. Such drawings, weights, and other data to be delivered to the Light-House Board within thirty days after the final trial trip; also a model, $\frac{1}{4}$ -inch scale, suitably mounted.

ENGINES, BOILERS, AND APPURTENANCES FOR TWIN SCREWS.

General description.—There will be two right and left handed cast-iron screw propellers, one under each counter, of about 6 feet 9 inches diameter and suitable pitch, each screw to be driven by an inverted-cylinder surface-condensing two-cylinder fore-and-aft compound engine, the cylinders to be 16 inches and 31 inches in diameter, with a stroke of 24 inches.

Screw propellers.—To be of cast iron, each about 6 feet 9 inches in diameter, of suitable pitch, and provided with four blades. They are to be secured to shaft by means of longitudinal keys and held in place by nuts screwed on and locked in place. The starboard propeller will be right and the port one left handed. The shaft casing will enter about 1 inch into the propeller boss and be fitted water tight; each boss will be finished at the after end by a composition cap bolted on water-tight. The propellers will be cast as smoothly as possible and have all roughness removed.

Boilers.—There are to be two cylindrical single-ended steel return tubular boilers, located as shown on plans, 11 feet 9 inches diameter outside the smallest course of shell, and 12 feet long from outside to outside of ends.

There are to be two Fox's patent corrugated furnaces in each boiler, 40 inches in diameter inside; corrugations to extend from the front end to the back tube-head and secured thereto by means of a single seam of rivets, of diameter and pitch to suit the thickness of the plates. The corrugations of furnaces are to alternate.

The back connections will be about 36 inches long at the bottom and about 33 inches at the top, increased in a direction parallel with the length of the boiler, and the side sheets are to be carried eccentric to the shell, so that the distance between the shell and said side sheet will be about $4\frac{1}{4}$ inches in the clear at the bottom, increasing upward to a distance, in the clear, of about $6\frac{1}{2}$ inches at the height of the top row of the tubes. The crown sheet is to be horizontal and stayed by means of wrought-iron girders, properly spaced, and formed at the ends to have bearings on the front, back, and crown plates, and have a clear space of not less than 2 inches between the crown sheet and the bottom of the girders.

The shells of the boilers will be made in two lengths longitudinally, the smaller courses toward the front or firing end, and of suitable thickness to meet the requirements of the United States steam-boiler inspection for a working pressure of 110 pounds per gauge. The circumferential seams will be double lap-riveted seams, and the longitudinal seams are to be properly spaced to clear all fittings, and are to be riveted and strapped to suit the requirements of the United States steam-boiler inspection for a working pressure as stated above.

The end plates shall be made in not more than two plates in each end plate; the seam joining the plates to be horizontal, and situated at a proper height above the tops of the tubes; seams to be double-riveted zigzag, with proper calking edges.

There are to be about one-hundred and sixty-two $3\frac{1}{4}$ inches outside diameter, best American lap-welded charcoal-iron boiler-tubes in each boiler; the distance between the tube-sheets from inside to inside to be about 8 feet 3 inches. Tubes to be spaced not less than $4\frac{1}{2}$ inches horizontally and vertically; a vertical space of about 5 inches in the clear to be left between the tubes in the center of the boiler, and two others not less than $2\frac{1}{2}$ inches, and located as per drawing. Tubes, spaces, etc., to be arranged according to drawings furnished by the Light-House Board. Stay tubes to be put in in a sufficient number to the satisfaction of the representatives of the Light-House Board. Tubes to be expanded and beaded over at both ends in the very best manner.

The scantlings of the boilers to be as follows: Shell-plates, $\frac{1}{2}$ inch in thickness. Front and rear tube-heads, $\frac{3}{4}$ inch. Back head of back connections, $\frac{1}{2}$ inch. Side sheets of back connections, $\frac{1}{2}$ inch. Crown sheet of back connections, $\frac{3}{8}$ inch. Upper part of end plates, $\frac{3}{4}$ inch; furnaces, $\frac{1}{2}$ inch; lower part rear end plate, $\frac{1}{2}$ inch.

The back connection will be stayed to the shell in a substantial manner and in accordance with the rules of the Board of Supervising Inspectors governing the construction of marine boilers to be used in salt water. The strain on the stays shall not exceed 5,000 pounds per square inch of section at the bottom of the thread, and all screw stays will have raised threads and be made without welds.

The front and back ends will be provided with stays extending from outside to outside of shells, with hexagonal nuts and stiffening plate outside, and nuts and castings inside to stiffen the end plates properly. A pair of 3 by 3 by $\frac{1}{2}$ inch angle-irons are to be securely riveted to the inside of the end plates, one on each side of the stay, and about $1\frac{1}{2}$ inches farther apart than the diameter of the stay.

The angle irons are to extend horizontally across the ends a sufficient distance beyond the outside stays to insure good work. The stays are to be spaced far enough apart to admit a man to pass between them to inspect the boiler. These stays are to be proportioned to stand a strain of not more than 5,000 pounds per square inch of section at the root of the thread. All plates are to be planed on the edges and thoroughly calked inside and outside. All rivet holes to be drilled to full size, and if any of the rivet holes should be partly blind they must be reamed fair.

Donkey boiler.—The contractor shall furnish and erect in the vessel, where shown on plans, ready for use, a vertical tubular boiler of sufficient size to give steam to both hoisting engines and all heaters simultaneously. This boiler shall be fitted with all pipes, connections, valves, instruments, etc., required by law and necessary for hoisting engines, for heating of the vessel throughout, and for connection with the donkey pump in engine room. Also suitable injector and feed pump, with all necessary fittings and tools.

Testing of boilers.—When the boilers are ready and before being lowered into the vessel, a hydrostatic pressure of 165 pounds per square inch by gauge shall be applied; all developing leaks shall be made tight carefully and effectually. Should rivets or socket bolts show such leaks as in the opinion of the representative of the Light-House Board would necessitate the cutting out of such rivets or bolts, this shall be done; the holes shall be made true if necessary, and new rivets or bolts fitted.

The hydrostatic test shall be continued until no leaks can be detected and until the result is entirely satisfactory.

These tests finished, the boilers shall be subjected to a steam pressure of not less than 40 pounds per square inch, continued long enough to satisfy the representative of the Light-House Board that the boilers are in absolute working order under the requirements of the contract and specifications, whereafter the boilers may be placed in the vessel.

The boilers (main and donkey) shall stand all tests and shall be provided with all fittings, valves, instruments, and appliances for safety, etc., prescribed by United States law and the rules and regulations of the Board of Supervising Inspectors of Steam Vessels.

Boiler material.—All the material of the boilers is to be open-hearth mild steel, with the exception of the tubes, and shall stand satisfactorily the tests adopted by the Light-House Board and specified in detail hereinafter.

Trial trip.—In addition to the necessary trials of the machinery at the dock, a trial trip is also to be made, of about twelve hours' duration, or as may be directed by the Light-House Board, at the expense of the contractor, and the engines must develop 650 indicated horse power when the engines are making 137 revolutions per minute, with a coal consumption of $2\frac{1}{4}$ pounds per indicated horse power, and steam, per gauge, at 100 pounds pressure per square inch. All bearings, journals, crank-pins, and other parts of the engine to show no tendency to heat or grip, but to run smoothly, the engine to pass its centers without shock or noise. The machinery must work on this trial trip to the entire satisfaction of the representative of the Light-House Board, and if any defects should develop on the trial, subsequent trials, at the expense of the contractor, as described above, will be made until every part of the machinery has been proven to be in accordance with the requirements of these specifications, to the satisfaction of the Light-House Board.

SPECIFICATIONS FOR SEARCH-LIGHT APPARATUS TO BE PLACED ON THE LIGHT-HOUSE
TENDER MAPLE.

Engine.—One 4 by 8 inch automatic horizontal engine (type to be approved by the Light-House Board), equipped with necessary oiling devices, sight-feed lubricator, wrenches, and other appliances necessary to operate engine.

Dynamo.—One automatic dynamo (type to be approved by the Light-House Board) of sufficient capacity to operate one 14-inch parabolic-reflector search-light, as hereinafter specified, and forty 16-candle power incandescent lamps. This dynamo shall have a fixed point of commutation, and shall operate from full to no load without adjustments. The armature of the dynamo shall be bolted to the engine. It shall be equipped with self-oiling bearings, and mounted on an iron stand.

Search-light.—One 14-inch search light of 3,000-candle power, with parabolic silver-plated reflector; brackets to be placed on each side of wheel-house to support search-lamp, and necessary electrical connection. The search light to be of best American manufacture of the description ordinarily used on merchant vessels, with hand regulating devices.

Switch-board.—A suitable switch-board shall be provided and located in engine room. It shall be equipped with four double-pole switches of the "quick break" class, mounted on marble panel.

Instruments.—A suitable ammeter and voltmeter shall be furnished and placed in cabinet containing switch.

Attachment plugs.—Suitable attachment plugs shall be placed on each side of the pilot-house for search light.

Incandescent lamps.—Forty incandescent lamps shall be furnished and placed as directed; they shall be equipped with key or keyless sockets, mounted on fixtures with necessary shades. There shall also be furnished twelve spare lamps and fittings. An extra socket with flexible wire cord attachment shall be placed in each

stateroom and chartroom, so that the lamps may be used in two places, the positions, to be designated by the light-house inspector.

Wiring.—Grimshaw white-core wire shall be employed throughout.

Capacity.—The capacity of the system of wiring shall be rated for double the number of ampères required to operate the search-light.

Molding.—The system of wiring throughout the boat shall be inclosed in molding.

Safety devices.—The system of wiring shall be equipped with necessary safety devices, and shall be mounted on porcelain.

Rules.—In general the installation shall conform with the rules of the New England Inspection Bureau, and subject to the inspection and approval of the representative of the Light-House Board.

The specifications for inspection of steel for use in the construction of the hull and machinery of the *Maple* are the same that have been used in the other tenders built by the Board.

155

- 30



155' 0"

.30' 0"

1



REPORT OF THE LIGHT-HOUSE BOARD, 1892.

APPENDIX No. 2.

**CORRESPONDENCE AND DATA RELATIVE TO AN INTERNATIONAL
UNIFORM SYSTEM OF BUOYAGE.**

INTERNATIONAL UNIFORM SYSTEM OF BUOYAGE.

DEPARTMENT OF STATE,
INTERNATIONAL MARINE CONFERENCE,
Washington, D. C., January 9, 1890.

NAVAL SECRETARY, LIGHT-HOUSE BOARD,
Treasury Department, Washington:

SIR: I have the honor to transmit herewith copy of final act of the International Marine Conference, containing rules, regulations, and recommendations approved by the Conference, and beg leave to call your attention to recommendations under general division 12 of the programme. I also send copy of committee report on this same division, with the request that the Light-House Board favor the American delegates with their opinions upon these various recommendations, as well as with any new recommendations upon the subject they may deem necessary in adopting legislation regarding buoyage of United States waters.

I am, sir, very respectfully, your most obedient servant,
For the American delegates:

V. L. COTTMAN,
Lieutenant, U. S. Navy, Secretary.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, January 31, 1890.

Lieut. RIDGELY HUNT, U. S. N.,

International Marine Conference, State Department, Washington, D. C.:

SIR: The Light-House Board is in receipt of your letter of January 9, 1890, in which, by direction of the secretary of the Marine Conference, you request that the Board submit to the American delegates any expression of its opinion concerning the conclusions of the Conference as contained in the final act and in the committee report on general divisions 9, 10, 11, and 12, and you are informed that the matter will be considered by the Board at its next meeting.

Respectfully,

D. B. HARMONY,
Rear-Admiral, U. S. N., Chairman.

DEPARTMENT OF STATE,
INTERNATIONAL MARINE CONFERENCE,
Washington, (no date).

DEAR SIR: I am directed by the secretary of the Marine Conference to request you to be so good as to submit to the American delegates any expressions of opinion you may have concerning the conclusions of the Conference as contained in the final act and in the committee report on general divisions 9, 10, 11, and 12, so as to enable them to frame their report in accordance therewith. There is to be a meeting of the American delegates on February 9.

Very respectfully, your obedient servant,

RIDGELY HUNT,
Lieutenant.

Admiral D. B. HARMONY, U. S. N.,
Washington, D. C.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, February 8, 1890.

Rear-Admiral S. R. FRANKLIN, U. S. Navy,
President International Marine Conference,
Department of State, Washington, D. C.:

SIR: The Board has the honor to acknowledge the receipt of a letter from the secretary of the Conference requesting the opinion of the Light-House Board concerning the conclusions of that body, as contained in the final act regarding divisions 10, 11, and 12.

In reply, the Board begs leave to state as follows:

In its opinion the adoption of *General Division 9* is advisable.

Division 10: (a) Very desirable. (b) The Board has no opinion to offer. With regard to the resolution submitted for the consideration of the Powers, its adoption is considered desirable.

Division 11: (a) (b) (c) Desirable. It is suggested, however, (a) that "magnetic" are more desirable than "true" bearings. Concerning the remainder of this division (1) is considered advisable; (2) advisable, but the compass points should also be given; (3) advisable; (4) advisable; (5) not necessary; (6) and (7) advisable; it is suggested that the visibility of a light should be stated for "clear" weather, as "mean" state of the weather is indefinite; (9) advisable; (10) no opinion; (11) and (12) advisable.

Division 12: (a) (b) Excellent. The suggestion for marking shoals on the compass system is thought desirable, but there is no such provision in the Light-House Regulations.

On page 25, the first paragraph is considered advisable. *Color:* Red for starboard-hand buoys, desirable. Port-hand buoys should be black. *Buoys* defining middle ground should be marked, it is thought, on the compass system. *Rocks in fairway:* On obstructions, or on shoals so small as to admit of a passage way on either side, should be marked by buoys with red and black horizontal stripes, as is now done by this Establishment in accordance with the present law. *Form:* It is believed that the present system employed by the Light-House Establishment is the best. The use of the spar buoy is determined on the American coasts by the local conditions of ice which in winter time necessitates their use in many localities. *Top-marks* are not much used by this Establishment and are not often considered necessary. *Numbers and letters:* Desirable, as far as many intersecting channels will permit. *Buoys and marking of wrecks:* (a) Desirable; (b) no opinion.

Respectfully,

GEORGE W. COFFIN,
Commander, U. S. Navy, Naval Secretary.

DEPARTMENT OF STATE,
INTERNATIONAL MARINE CONFERENCE,
Washington, February 10, 1890.

The LIGHT-HOUSE BOARD,
Treasury Department, Washington, D. C.

SIRS: I have the honor to acknowledge the receipt of communication of the 8th instant from the Light-House Board, expressing its opinion concerning the conclusions of the Conference regarding divisions 9, 10, 11, and 12 of the program which will be communicated to the United States delegates at the meeting to be held to-day.

I beg leave here to express my thanks, as well as those of the United States delegates, for your coöperation in the matter and for the valuable assistance rendered during the session of the Conference.

I am, sir, very respectfully,

S. R. FRANKLIN,
Rear-Admiral, U. S. Navy, President.

DEPARTMENT OF STATE,
Washington, October 4, 1890.

The SECRETARY OF THE TREASURY:

SIR: I have the honor to inclose for your information copy of a joint resolution of Congress requesting and directing the Secretary of State, the Secretary of the Treasury, the Secretary of War, and the Secretary of the Navy "to examine the report and recommendations made by the delegates of the United States in the International Marine Conference, dated February 20, 1890, and as far as the same apply to subjects under the jurisdiction of their respective Departments, and are approved by them, to prepare and submit to Congress bills for the enactment into law of said recommendations."

I have the honor to be, sir, your obedient servant,

JAMES G. BLAINE.

IN THE SENATE OF THE UNITED STATES,
September 24, 1890.

Resolved by the Senate (the House of Representatives concurring), That the Secretary of State, the Secretary of the Treasury, the Secretary of War, and the Secretary of the Navy be requested, and they are hereby directed, to examine the report and recommendations made by the delegates of the United States in the International Marine Conference, dated February 20, 1890, and, as far as the same apply to subjects under the jurisdiction of their respective Departments and are approved by them, to prepare and submit to Congress bills for the enactment into law of said recommendations.

Attest:

ANSON G. MCCOOK,
Secretary.

IN THE HOUSE OF REPRESENTATIVES,
September 29, 1890.

Resolved, That the House of Representatives agree to the foregoing resolution of the Senate.

Attest:

EDW. MCPHERSON,
Clerk.

TREASURY DEPARTMENT,
Washington, October 10, 1890.

The LIGHT-HOUSE BOARD:

The concurrent resolution of the Senate and House of Representatives dated September 24, 1890, requesting and directing the Secretary of State, the Secretary of the Treasury, the Secretary of War, and the Secretary of the Navy to examine the report and recommendations made by the delegates of the United States in the International Marine Conference, dated February 15 (20), 1890, as far as the same apply to the subjects under the jurisdiction of their respective Departments are approved by them, to prepare and submit to Congress bills for the enactment into law of said recommendations, has been referred to Assistant Secretary Spaulding, and you are requested to confer with him relative thereto.

Very truly, yours,

W. WINDOM,
Secretary.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, October 11, 1890.

Capt. HENRY F. PICKING, U. S. N.,
Inspector Third Light-House District, New York:

SIR: Please make one of a board, of which you will act as chairman, composed of yourself, Commander George F. F. Wilde, U. S. Navy, inspector second light-house district, and Commander P. F. Harrington, U. S. Navy, inspector of the fourth light-house district, to meet at the light-house depot, Staten Island, New York, and to carefully consider the recommendations of the International Marine Conference, as contained in General Divisions 11 and 12, pages 484 to 493, of its report, a copy of which was sent you July 23, 1890, and to make report thereon, with views as to the most satisfactory method of embodying the recommendations of the conference in a bill to be introduced in the next Congress.

When it is convenient for the board to meet, please notify the other members who have already been given preliminary instructions.

Respectfully,

GEO. W. COFFIN,
Commander, U. S. Navy, Naval Secretary.

UNITED STATES GENERAL LIGHT-HOUSE DEPOT,
OFFICE OF UNITED STATES LIGHT-HOUSE INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., November 18, 1890.

The LIGHT-HOUSE BOARD,
Washington, D. C.:

SIRS: Referring to the Light-House Board's letter of October 11, 1890, I have the honor to forward herewith the report of the board appointed to consider rules on the subject of aids to navigation proposed by the International Marine Conference. Respectfully submitted.

HENRY F. PICKING,
Captain, U. S. Navy, Inspector.

U. S. GENERAL LIGHT-HOUSE DEPOT,
OFFICE OF U. S. LIGHT-HOUSE INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., November 12, 1890.

The LIGHT-HOUSE BOARD,
Washington, D. C.:

SIRS: In obedience to the order of the Light-House Board, dated October 11, 1890, we have the honor to submit the following report:

After careful consideration of the rules proposed by the International Marine Conference, stated in the third volume of the report of said Conference, page 488, and numbered from 1 to 12, both inclusive, in connection with the practice now followed in the United States, we consider that the first, third, fourth, and sixth of such rules should be adopted.

We recommend that, in carrying out the second rule, the bearings of lights defining a narrow channel shall be expressed in compass points from the magnetic north or south point and followed immediately, in parentheses, by the same bearings expressed in degrees.

Fifth rule: We recommend that magnetic bearings be used, expressed in points followed by the true bearings, expressed in degrees in parentheses.

Seventh rule: We recommend that the longitude of positions stated in all publications and charts for the use of navigators shall be reckoned from the meridian of Greenwich as a prime meridian.

Eighth rule: We recommend that the range or visibility of light shall be given for a clear state of weather.

Ninth and tenth rules: We recommend that the geographical range of lights (column "Distance visible in nautical miles," list of light-houses, etc.) shall be given as seen at high water by an observer 15 feet above the sea, and that the classification of lights based on luminous intensity (column "Order of light") be omitted from the light list, retaining only the distinctive character of each light as seen by the mariner (column "Characteristic of light").

Eleventh rule: We are of the opinion that the issue of notices to mariners and other information intended for the use of mariners in navigating vessels, for dissemination at home and abroad, should be issued only from one office, reserving to the various offices which now issue such notices the right to issue notices for immediate use in the vicinity of the coast of the United States. Information for mariners which it is desired to publish for general dissemination should be forwarded immediately by the Light-House Board, the Coast and Geodetic Survey, and the office of engineers having public works under its direction to the Hydrographic Office of the Navy Department, and the said hydrographic office should issue daily a general notice embracing all such information so reported or otherwise ascertained. This method will enable the Light-House Board, the inspectors of the light-house districts and offices providing information for the use of mariners to issue a notice to those immediately and locally interested; but we are strongly of the opinion that all the information on this subject should be collected in one office and systematically published, the publications of that office embracing all information, whether originating in the United States or abroad. We recommend, also, that Congress be asked to direct the President to enter into correspondence with the other maritime countries to determine the method of exchanging notices to mariners, light lists, and other nautical information, so that there shall be no unnecessary delay in the dissemination of such information.

Twelfth rule: The adoption of the system recommended in the remarks under the eleventh rule will exclude the United States from the operation of the twelfth rule.

Turning now to the subject of buoyage, we submit the following recommendations, based upon the general principles recommended by the International Marine Conference:

The term "starboard hand" shall define that side of a navigable channel which is on the right hand of the mariner entering from seaward; the term "port hand" shall define that side which is on the left hand under the same circumstances.

Buoys defining the starboard hand of a channel shall be painted a single red color. Buoys defining a port side of a channel shall be painted a single black color. Buoys defining obstructions shall be painted with horizontal bands, alternately red and black, the first stripe at the top being red. A buoy defining a junction of two channels, either a can or a nun buoy or an iron spar buoy, shall be surmounted by a cage.

We recommend the adoption of the compass system of buoys marking shoals, as follows:

The north side of a shoal, the buoy to be painted with white and black perpendicular stripes; the south side with white and black stripes inclining from the top of the buoy towards the left at the bottom, the angle of inclination to be 45° ; the east side of a shoal, white and red, horizontally placed, the upper half of the buoy white and the lower half red; the west side of a shoal similarly marked, the upper portion black in color and the lower half white. The forms of buoys marking shoals to follow the rules for channel buoys, to be stated presently.

It will be observed that the marks recommended by the International Marine Conference for the points of a shoal will not agree with our present system of buoyage. We have therefore suggested a change by which such disagreement can be removed.

The International Marine Conference has omitted mention of the mid-channel buoy now used in the waters of the United States. Upon the adoption of the system of

buoyage herein recommended, we are of the opinion that it will be desirable to abolish the mid-channel buoy. The colors now used for that buoy can then be used without confusion in marking the north side of shoal. White and black perpendicular stripes upon a buoy now have, however, a definite signification under section 4678, Revised Statutes of the United States. The mid-channel buoys are very frequently dragged out of position. In wide channels they are regarded as unnecessary; in narrow channels they may be properly replaced by buoys marking each side of the channel.

Buoys defining the starboard hand of a channel shall be nun buoys and those defining the port hand can buoys, except when necessary to use spar buoys. Starboard hand spar buoys shall be surmounted by a spindle, 18 inches in length and 2 inches in diameter. In recommending that a starboard-hand spar buoy shall be surmounted by a spindle, we have been influenced by our individual experience that the paint is frequently and even generally cut off from spar buoys by movement of ice, by vessels passing over them, or, when placed in a strong current, by the force of the water running over them, making it impossible to distinguish a port-hand spar buoy from a starboard-hand one. We regard it as an important consideration that spar buoys of the starboard hand shall be distinguished by a top mark from those of the port side of a channel, extending the principle adopted in the positions of nun and can buoys.

The buoys defining a channel shall be numbered consecutively, beginning at the seaward entrance of the channel, the port-hand buoys designated by odd numbers and the starboard-hand buoys by even numbers. The numbers shall be painted in white upon the sides of buoys, of uniform size for each order of buoys.

We recommend that buoys or the top sides of vessels used for marking all wrecks shall be painted green, and the word "Wreck" or an abbreviation "Wr." or "W" painted in white upon the buoy or vessel, the full word or the abbreviation, according to the size of the buoy or vessel.

In conclusion the Board recommends that all charts, sailing directions, and other publications issued by or under the authority of the United States, for the guidance of mariners in navigating vessels, shall be made to conform to the rules which may be adopted in relation to the subjects of these recommendations.

Respectfully submitted.

HENRY F. PICKING,
Captain, U. S. Navy, Chairman of the Board.
P. F. HARRINGTON,
Commander, U. S. Navy, Member.
GEORGE F. F. WILDE,
Commander, U. S. Navy, Member.

WASHINGTON, D. C., December 18, 1890.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES:

SIR: I have the honor to transmit herewith a letter from the Light-House Board of December 18, 1890. The letter incloses a draft of a bill which, in the Board's opinion, will best carry out the suggestions contained in divisions numbered eleven and twelve of the report of the International Marine Conference.

The Board had been requested to prepare this bill, as it contains matters with which it is specially charged.

Respectfully, yours,

A. B. NETTLETON,
Acting Secretary.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, D. C., December 18, 1890.

The SECRETARY OF THE TREASURY:

SIR: In pursuance with the request contained in the Department letter of October 7, 1890, the Board has the honor to state that it has given careful attention and consideration to the report of the International Marine Conference referring to those subjects with which it has been charged, and incloses herewith a draft of a bill to be presented to Congress, which, in its opinion, will best carry out the suggestions contained in the report above mentioned.

Respectfully, yours,

GEO. W. COFFIN,
Commander, U. S. Navy, Naval Secretary.

A BILL to carry into effect the recommendations contained in divisions numbered eleven and twelve of the report of the International Marine Conference, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in issuing notices of dangers to navigation hereafter, in the notices to mariners, light-house and buoy lists, all bearings shall be given from seaward.

SEC. 2. That the bearings of cuts and different colored sectors of lights or bearings of lights defining a narrow channel shall be magnetic, expressed in compass points from the magnetic north or south point, and followed immediately by the true bearings expressed in degrees in parenthesis.

SEC. 3. That all bearings expressed in degrees shall count from north and south from zero to ninety degrees towards east and west.

SEC. 4. That in designating bearings the letter E shall designate east, and the letter W shall designate west. That whenever bearings are given they shall be magnetic, expressed in compass points from the magnetic north or south point, and followed immediately by the true bearings, expressed in degrees in parenthesis.

SEC. 5. That distance shall be expressed in nautical miles and fractions thereof, and the word cable shall mean the tenth part of a nautical mile, except on the northern and northwestern lakes.

SEC. 6. That longitude of positions stated in all publications for the use of navigators shall be reckoned from the meridian of Greenwich as a prime meridian.

SEC. 7. That in defining the range of visibility of a light it shall be stated for clear weather.

SEC. 8. That when the geographical range of a light is given it shall be calculated as seen at high water by an observer fifteen feet or five meters above the sea. That the central offices that issue notices to mariners, or light and buoy lists, shall be permitted to correspond directly on such subjects.

BUOYAGE.

SEC. 9. That the term starboard hand shall define that side of a navigable channel which is on the right hand of the mariner entering from seaward.

SEC. 10. That the term port hand shall define that side which is on the left hand under the same circumstances.

SEC. 11. That buoys defining the starboard hand of a channel shall be painted a single red color. That buoys defining the port side of a channel shall be painted a single black color.

SEC. 12. That buoys defining rocks or obstructions in a fairway, with a channel way on either side, shall be painted with horizontal bands alternately red and black, the first stripe at the top to be red.

SEC. 13. That where a buoy is necessary to define the junction of two or more channels it shall be a can buoy or an iron spar buoy painted with vertical black and white stripes.

SEC. 14. That shoals of limited extent shall be marked on the compass system; the north side of the shoal by a buoy painted with white and black checks; the south side of the shoal by a buoy painted with red and black checks; on the east side by a buoy painted the upper half white and the lower half red, horizontally placed; on the west side by a buoy painted with four vertical stripes alternately red and black. Extensive shoals with channel on either side shall be marked by the regular channel buoys.

SEC. 15. That buoys defining the starboard hand of a channel shall be can or conical buoys, and those defining the port hand shall be can buoys, except when necessary to use spar buoys, in which case starboard-hand spar buoys shall be surmounted by a spindle eighteen inches in length and two inches in diameter. The port-hand spar buoys are to be without this distinctive mark.

SEC. 16. That buoys defining a channel shall be numbered consecutively, beginning at the seaward entrance to the channel. The port-hand buoys shall be designated by odd numbers and the starboard-hand buoys by even numbers. The numbers shall be painted in white upon the side of the buoys, in uniform size for each order of buoy.

SEC. 17. That all buoys and the top sides of vessels used for marking wrecks shall be painted green and the word Wreck or the letter W painted in white upon the buoy or vessel, the full word or the letter to be used, according to the size of the buoy or vessel.

DEPARTMENT OF STATE,
Washington, March 14, 1892.

The SECRETARY OF THE TREASURY.

SIR: I have the honor to inclose for your information and consideration a copy of a note from the British minister at this capital proposing the adoption of an international uniform system of buoyage.

I have the honor to be, sir, your obedient servant,

WILLIAM F. WHARTON,
Acting Secretary.

BRITISH LEGATION,
Washington, 8th March, 1892.

SIR: Her Majesty's Government have had under their consideration the proposal of the International Maritime Conference of Washington for a universal system of Buoys and Beacons, and I have now the honour, in accordance with instructions from the Marquis of Salisbury, to enclose two copies of a paper showing such a system and to state that the United Kingdom, India, and Her Majesty's colonies are prepared to adopt it.

I have the honour, etc.,

JULIAN PAUNCEFOTE.

Hon. JAMES G. BLAINE, etc.

UNIFORM SYSTEM OF BUOYAGE.

1. The mariner, when approaching the coast, must determine his position on the chart, and must note the direction of the main stream of flood tide.
2. The term starboard hand shall denote that side which would be on the right

hand of the mariner, either going with the main stream of flood or entering a harbour, river, or estuary from seaward; the term port hand shall denote the left hand of the mariner under the same circumstances.

3. Buoys showing the pointed top of a cone above water shall be called conical, and shall always be starboard hand buoys, as above defined.

4. Buoys showing a flat top above water shall be called can, and shall always be port hand buoys, as above defined.

5. Buoys showing a domed top above water shall be called spherical, and shall mark the ends of middle grounds.

6. Buoys having a tall central structure on a broad base shall be called pillar buoys, and like other special buoys, such as bell buoys, gas buoys, automatic sounding buoys, &c., &c., shall be placed to mark special positions, either on the coast or in the approaches to harbours, &c.

7. Buoys showing only a mast above water shall be called spar buoys.

8. Starboard hand buoys shall always be painted a single red colour.

9. Port hand buoys shall be painted of another characteristic colour, either black or parti-colour.

10. Spherical buoys at the ends of middle grounds shall always be distinguished by horizontal stripes of white colour.

11. Surmounting topmarks, such as staff and cone, &c., shall always be painted one dark colour.

12. Staff and cone shall only be used on starboard hand buoys; staff and cylinder on port hand; globes at the outer ends of middle grounds, and half globes (round part uppermost) at the inner ends.

13. Buoys on the same side of a channel, estuary, or tide way may be distinguished from each other by names or consecutive numbers or letters commencing from seaward, and where necessary by a staff surmounted with the appropriate topmark.

14. Fairway buoys shall always be painted in horizontal stripes of white colour, and shall be surmounted with a staff only.

15. Buoys intended for moorings, &c., may be of shape or colour according to the discretion of the authority within whose jurisdiction they are laid, but for marking submarine telegraph cables the colour shall be green, with the word "telegraph" painted thereon in white letters.

BUOYING AND MARKING OF WRECKS.

16. Wreck buoys in the open sea, or in the approaches to a harbour or estuary, shall be coloured green, with the word "Wreck" painted in white letters on them.

17. When possible the buoy shall be laid near to the side of the wreck next to mid-channel.

18. When a wreck-marking vessel is used it shall, if possible, have its top sides coloured green with the word "Wreck" in white letters thereon, and shall exhibit—

By day: Three balls on a yard 20 feet above the sea, two placed vertically at one end, and one at the other, the single ball being on the side nearest to the wreck.

By night: Three white fixed lights similarly arranged but not the ordinary riding light.

19. In narrow waters or in rivers, harbours, &c., under the jurisdiction of local authorities, the same rules may be adopted, or at discretion varied as follows:—

When a wreck-marking vessel is used she shall carry a yard on a mast with two balls by day, placed horizontally, not less than 6 nor more than 12 feet apart, and two lights by night similarly placed. When a barge or boat only is used a flag or ball may be shown in the daytime.

20. The position in which the marking vessel is placed, with reference to the wreck, shall be at the discretion of the local authority having jurisdiction.

TREASURY DEPARTMENT,
OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, March 16, 1892.

Capt. W. S. SCHLEY, U. S. N.,

Inspector Third Light-House District, New York, N. Y.:

SIR: The Light-House Board has created a board which is to meet at the Staten Island general depot on the call of its chairman, to consider and report on the subject of an international uniform system of buoyage. It is composed of the inspectors of the third, fourth, and second districts, and the assistant to the inspector of the Third Light-House District, who will act as recorder. You are directed to act as chairman, and you will call the board together as soon as, in your discretion, it may be deemed proper to do so.

Inclosed there are sent to you, for the consideration of your board—

1. A copy of the report dated October 11, 1890, of the Picking Board on a Uniform System of Buoyage.
2. A copy of a draft of a bill submitted to Congress by the Light-House Board to secure a uniform system of buoyage.
3. A copy of a letter from the Department of State of March 14, 1892, submitting—
4. A copy of a letter dated March 8, 1892, from the British minister at this capital to the Department of State, inclosing—
5. A copy of a printed paper entitled "Uniform System of Buoyage."

Your board is directed to consider these papers, and especially the English plan, and to report as early as practicable a plan with its views as to the best method of harmonizing the two in such a way that both nations can agree.

Respectfully,

GEO. W. COFFIN,
Commander, U. S. N., Naval Secretary.

Data for a bill to carry into effect the recommendation contained in divisions numbered eleven and twelve of the report of the International Marine Conference, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in issuing notices of dangers to navigation hereafter, in the notices to mariners, light-house and buoy lists, all bearings shall be given from seaward.

SEC. 2. That the bearings of cuts and different colored sectors of lights or bearings of lights, defining a narrow channel, shall be magnetic, expressed in compass points from the magnetic north or south point, and followed immediately by the true bearings, expressed in degrees in parenthesis.

SEC. 3. That all bearings expressed in degrees shall count from north and south from zero to ninety degrees toward east and west.

SEC. 4. That in designating bearings the letter E shall designate east, and the letter W shall designate west. That whenever bearings are given they shall be magnetic, expressed in compass points from the magnetic north or south point, and followed immediately by the true bearings, expressed in degrees in parenthesis.

SEC. 5. That distance shall be expressed in nautical miles and fractions thereof, and the word "cable" shall mean the tenth part of a nautical mile, except on the northern and northwestern lakes.

SEC. 6. That the longitude of positions stated in all publications for the use of navigators shall be reckoned from the meridian of Greenwich as a prime meridian.

SEC. 7. That in defining the range of visibility of a light it shall be stated for clear weather.

SEC. 8. That when the geographical range of a light is given it shall be calculated as seen at high water by an observer fifteen feet or five meters above the sea. That the central offices that issue notices to mariners, or light and buoy lists, shall be permitted to correspond directly on such subjects.

BUOYAGE.

SEC. 9. That the term "starboard hand" shall define that side of a navigable channel which is on the right hand of the mariner entering from seaward.

SEC. 10. That the term "port hand" shall define that side which is on the left hand under the same circumstances.

SEC. 11. That buoys defining the starboard hand of a channel shall be painted a single red color. That buoys defining the port side of a channel shall be painted a single black color.

SEC. 12. That buoys defining rocks or obstructions in a fairway, with a channel way on either side, shall be painted with horizontal bands alternately red and black, the first stripe at the top to be red.

SEC. 13. That where a buoy is necessary to define the junction of two or more channels it shall be a can buoy or an iron spar buoy painted with vertical black and white stripes.

SEC. 14. That shoals with channel on either side shall be marked by the regular channel buoys.

SEC. 15. That buoys defining the starboard hand of a channel shall be nun or conical buoys, and those defining the port hand shall be can buoys, except when necessary to use spar buoys, in which case starboard-hand spar buoys shall be surmounted by a spindle eighteen inches in length and two inches in diameter. The port-hand spar buoys are to be without this distinctive mark.

SEC. 16. That buoys defining a channel shall be numbered consecutively, beginning at the seaward entrance to the channel. The port-hand buoys shall be designated by odd numbers and the starboard-hand buoys by even numbers. The numbers shall be painted in white upon the side of the buoys in uniform size for each order of buoy.

SEC. 17. That all buoys and the top sides of vessels used for marking wrecks shall be painted green, and the word wreck or the letter W painted in white upon the buoy or vessel, the full word or the letter to be used accordingly to the size of the buoy or vessel.

SEC. 18. That all beacons, spindles, and day marks used by the Light-House Establishment as aids to navigation shall be as follows, namely: On the port side of channels entering from the sea these aids, of whatever nature, shall be painted black and carry as a top mark a black cylindrical cage. On the starboard side entering from the sea the aids shall be painted red and carry a red conical cage as a top mark. Beacons, spindles, or day marks placed at the junction of two or more channels shall carry a top mark, which, seen from all directions, shall appear as a cross, the whole to be painted with black and white vertical stripes. Beacons, spindles, or day marks defining rocks or obstructions in a fairway, with a channel way on either side, shall carry a top mark, which from all directions will appear as a circular cage, the whole to be painted with horizontal bands, alternately red and black, the first stripe at the top to be red.

TREASURY DEPARTMENT,
OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, March 16, 1892.

Capt. W. S. SCHLEY, U. S. N.,

Inspector Third Light-House District, New York, N. Y.:

SIR: Inclosed there is sent you a clipping from a recent newspaper, showing the changes made in the system of buoyage on the French coast, which were put in operation in October last.

It may be well for the board, of which you are chairman, to consider this in connection with the British and American plans.

Respectfully,

GEO. W. COFFIN,
Commander, U. S. N., Naval Secretary.

LIGHT-HOUSE ESTABLISHMENT,
GENERAL DEPOT, OFFICE OF INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., March 21, 1892.

The LIGHT-HOUSE BOARD,
Washington, D. C.:

SIRS: I have the honor to inform you that I have convened the board to "consider and report on the subject of an international uniform system of buoyage," to assemble on Tuesday, April 5, at 10 a. m., at this depot.

Very respectfully,

W. S. SCHLEY,
Captain, U. S. N., Inspector.

U. S. GENERAL LIGHT-HOUSE DEPOT,
OFFICE OF U. S. LIGHT-HOUSE INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., April 17, 1892.

The LIGHT-HOUSE BOARD,
Washington, D. C.:

SIRS: In compliance with the Board's order of March 16, referring to the subject of a uniform system of buoyage, and creating a board composed of the inspectors of the third, fourth, and second districts and the assistant inspector of the third district to act as recorder, to meet at the call of the chairman, we have the honor to inform you that the board met at this depot on the morning of April 5, at 10:30 a. m., and proceeded to consider the papers inclosed with Light-House Board's instructions.

After a full and free discussion of the various papers submitted to the Board, and especially the English plan, it was found that little difference really existed between the system of buoyage used in this country and that proposed by the English Government.

The memorandum submitted by Sir Julian Pauncefote, in behalf of the British Government, to secure uniformity in the system of buoyage, contains twenty separate propositions. A careful examination of them by the board, shows that Her Majesty's Government agrees with the present system observed in the United States:

(1) In the manner of designating the starboard and port hand of the mariner entering a harbor, river, or estuary.

(2) That buoys showing a pointed top or cone above the water shall be called conical and shall always be starboard-hand buoys.

(3) That buoys showing a flat top above the water shall be called can and shall be port-hand buoys.

(4) That buoys showing only a mast above the water shall be called spar buoys.

(5) That starboard-hand buoys shall always be painted a single red color.

(6) That port-hand buoys shall always be painted another characteristic color, black or particolor.

(7) That special buoys such as bell buoys, gas buoys, automatic-sounding buoys, etc., shall be placed to mark special positions either on the coast or in approaches to harbors.

(8) That buoys on the same side of a channel, river, or estuary may be distinguished from each other by consecutive numbers or letters, commencing from seaward.

The memorandum, on the contrary, shows a disagreement with the practice observed in the United States:

(1) In prescribing a buoy of dome-shaped top above the water to be called spherical and distinguished by horizontal stripes of white color, to mark the ends of middle grounds.

(2) In prescribing a buoy having a tall central structure on a broad base to be called pillar buoys, and intended to mark special positions.

(3) In prescribing that staff and cone shall be used on starboard hand and that staff and cylinder on port-hand buoys; that globes shall be used on spherical buoys marking outer ends, and that half globes (round part uppermost) at the inner ends of middle grounds.

(4) That fairway buoys shall always be painted in horizontal stripes of white color and shall be surmounted with a staff only.

The memorandum suggests several other features as aids to navigation, which appear to the board as well worth consideration, as they cover needs which our system does not embrace:

(1) "In marking submarine telegraph cables the buoy used shall be green with the word 'telegraph' painted thereon in white letters.

(2) "Wreck buoys in the open sea, or in approaches to a harbor or estuary, shall be colored green with the word 'wreck' painted in white letters on them.

(3) "When possible the buoy shall be laid near to the side of the wreck next to mid-channel.

(4) "When a vessel is used to mark a wreck it shall, if possible, have its top sides colored green with the word 'wreck' in white letters thereon, and shall exhibit:

"By day: Three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest the wreck.

"By night: Three white lights similarly arranged, but not the ordinary riding lights.

(5) "In narrow waters, or in rivers, harbors, etc., under jurisdiction of local authorities, the same rules may be adopted, or, at discretion, varied, as follows:

"When a wreck-marking vessel is used she shall carry a yard on a mast with two balls by day, placed horizontally, not less than 6 nor more than 12 feet apart, and two lights by night similarly placed. When a barge or boat is used, a flag or balls may be shown in the daytime.

"The position in which the marking vessel is placed with reference to the wreck shall be at the discretion of the local authority having jurisdiction."

Before considering the points involved in the memoranda, the board agreed that the fewer forms of buoys employed and the simpler the colors used to distinguish them the better, and that any attempt to secure uniformity in the system of buoyage which will not eliminate many of the varieties and forms or colors used at present, would oppose the spirit which underlies the movement to secure it. To the practical and sensible seafaring man who is to be benefited by the adoption of the simplest system of forms and colors in buoying channels, it is a duty to reduce these to such extent that there can be no possible confusion in these days when ships move at such high rates of speed in and out of ports. As the points in which the two governments agree needed no discussion, the Board proceeded to consider the four propositions in which there was a slight disagreement, as well as the other five of the memorandum which contain some features that our system of aids to navigation does not include.

The dome-shaped buoy distinguished by horizontal stripes of white color, to mark the ends of middle grounds, the Board believes a most effective and desirable distinction of shape, if it is made to show a complete hemisphere above the water.

With reference to the buoy called pillar buoy, intended to mark special positions the Board believes that the several shapes of bell buoys, gas buoys, automatic sounding buoys, are sufficiently numerous for such purposes and ought not to be further complicated by additional shapes.

With regard to the third point of disagreement, that staff and cone shall mark starboard-hand, and the staff and cylinder shall mark port-hand buoys, and that globes shall be used on spherical buoys marking outer ends, and that half globe (round part uppermost) shall mark the inner ends of middle grounds, the Board considers such marks impracticable in the harbors and rivers of the United States north of the Chesapeake Bay, during the winter months, for the reason that at this time of the year our harbors are usually filled with ice which the strong currents in every change of the tides carry back and forth, sweeping over the buoys, often crushing them. Most surely the ice would sweep away or destroy such top marks as those suggested, except, perhaps, in the case of spar buoys having some form of spindle or staff.

In the milder climate of England, where ice seldom is so troublesome, and in the almost tideless region of the Skagger Rack and Categat, the German and Baltic seas, top marks are not so difficult to maintain as in our waters, where almost endless expense for repair would be necessary in cases where it is important to maintain the nun or can buoys during the winter season in our channels.

But the spar buoy on the starboard side of channels ought to be distinguished by a spindle on its top, 2 feet long and 2 inches wide, as the distinctive colors are obliterated by ice overrunning them in winter.

With regard to the fairway buoy, the Board is of opinion that it is an unnecessary aid in channels marked clearly by nuns and cans and is more often an obstruction. These buoys are so often sunk by collision that we would recommend their discontinuance.

The Board is of opinion, further, that the forms of conical or nun, can, and hemispherical buoys, to mark the sides of channels and ends of middle grounds, are sufficiently distinctive and simple for all purposes.

Referring to those features of the memorandum submitted by Her Majesty's Government, in which aids to navigation unknown in our system of buoyage are comprehended, the Board is of opinion—

(1) That, as submarine-telegraph cables are now so general and as we have no buoy to indicate their position, it would be well to adopt the green buoy with the word "Telegraph" painted thereon in white letters, to mark such localities.

(2) That, as it would only require the color of wreck buoys in the open sea or in approaching a harbor or estuary to be changed from black and red horizontal stripes to a solid green color to secure harmony in marking wrecks or obstructions, the Board agrees that it would be wise to do so.

(3) That it would be better to locate a buoy marking a wreck near the side next to mid-channel, when possible to do this.

(4) That, when a vessel is used to mark a wreck, as we have no such system provided, to adopt, in the interest of harmony, that submitted in the memorandum as follows:

The vessel to be colored green on its top sides with the word "Wreck" in white letters thereon, and to show—

By day: Three balls on a yard 20 feet above the sea: two placed vertically at one end and one at the other, the single ball being on the side nearest the wreck.

By night: Three white lights similarly arranged, but not the ordinary riding light.

(5) The Board disagrees with that feature in the memorandum where in narrow waters or in rivers, harbors, etc., under jurisdiction of local authorities, the rule prescribed for marking wrecks be varied at discretion, to allow the use of different

day signals or night lights, or that the location of the vessel under such circumstances should be at the discretion of local authorities. The Board believes that one general system should be adhered to as much simpler and more consistent.

(6) The Board is of opinion that special buoys placed to seaward to mark the entrance to channels should be painted with white and black perpendicular stripes and that no other class of buoys should have this distinctive mark. And when placed to mark other special points their color should correspond to the side of the channel on which they are located, as other channel buoys.

The Board, therefore, submits the following memoranda as the result of their conclusions on the subject of a uniform system of buoyage:

ART. 1. The mariner, when approaching the coast, must determine his position on the chart and must note the direction of the main stream of flood tide.

ART. 2. The term starboard hand shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbor, river, or estuary from seaward. The term port hand shall denote the left hand of the mariner under the same circumstances.

ART. 3. Buoys showing the pointed top of a cone above water shall be called conical and shall always be starboard-hand buoys, as above defined.

ART. 4. Buoys showing a flat top above water shall be called can and shall always be port-hand buoys, as above defined.

ART. 5. Buoys showing a hemispherical dome-shaped top above the water shall be called spherical and shall mark the ends of middle grounds.

ART. 6. Buoys showing only a mast above water shall be called spar buoys.

ART. 7. Starboard-hand buoys shall always be painted a single red color.

ART. 8. Port-hand buoys shall be painted a single black color.

ART. 9. Hemispherical buoys at the ends of middle grounds or marking shoals in harbors or their approaches shall always be distinguished by horizontal stripes of white color, black beginning at the top.

ART. 10. Spar buoys on the starboard hand entering channels to be surmounted by a spindle two (2) feet high and two (2) inches wide.

ART. 11. Conical buoys on the starboard hand of a channel, estuary, or river to be distinguished by even numbers painted in white letters. Can buoys on the port hand to be distinguished by odd numbers painted in white letters, beginning from seaward.

ART. 12. Buoys for marking submarine-telegraph cables to be colored green, with the word "Telegraph" painted thereon in white letters.

ART. 13. Wreck buoys in the open sea or in approaches to a harbor or estuary shall be colored green with the word "Wreck" painted in white letters thereon.

ART. 14. When a wreck-marking vessel is used, it shall, if possible, have its top sides colored green, with the word "Wreck" in white letters thereon, and shall exhibit—

By day: Three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck.

By night: Three white fixed lights similarly arranged, but not the ordinary riding light.

ART. 15. When possible the buoy laid to mark a wreck shall be near to the side next to mid-channel.

ART. 16. When a wreck-marking vessel is used to mark a wreck she shall be moored as near as possible to seaward of danger or next to mid-channel when it can be done.

ART. 17. Special buoys, such as bell buoys, gas buoys, automatic sounding buoys, when placed to mark entrance to a harbor, estuary, or river, shall be painted in white and black vertical stripes. When placed to mark other special positions, they shall be painted the color to correspond with the side of the channel or estuary on which located.

In further considering the inclosures submitted with the Board's instructions, it is observed in the report of the Picking Board, dated November 12, 1890, that the recommendation of this Board as to the second and fifth rules proposed for consideration to the maritime powers by the International Marine Conference and stated on page 488, vol. III, in the report of the United States delegates, is confusing. The recommendation as to Rule 2 assigns a particular use to degrees inclosed in parenthesis. The suggestion as to the fifth rule implies another meaning for degrees inclosed in parenthesis.

It would be better to follow the former recommendation and to adopt Rule 2 as reported by the conference, p. 489.

The ordinarily accepted meaning of figures in a parenthesis, following figures written out as words, is a repetition for emphasis and to avoid mistakes.

Sections 2 and 4 of the bill prepared by the Light-House Board are open to the objectionable feature that they are confusing.

The magnetic course or bearing is the one needed immediately and used constantly by mariners, while the true bearing or true course is seldom necessary and never required in a hurry.

Many vessels are steered by degrees instead of by compass points.

It would seem best to give all bearings as magnetic in compass points and to repeat in degrees and to state the variations or to follow Rule 5, p. 489, vol. III, of the report of the International Marine Conference.

There is one other subject, however, which, though it does not come within the scope of the Board's instructions, yet would appear to be not out of place in this report upon the subject of a uniform system of buoyage. Under our present system we have three classes of nun and can buoys, the third class of each differing so much in size and in the distances at which they may be seen, the Board would recommend that only first and second class nuns and cans be used under the uniform system proposed for buoyage and that the third-class buoy be discontinued in future buoyage of channels, rivers, or estuaries.

Very respectfully,

W. S. SCHLEY,
Captain U. S. N., Chairman.
 P. F. HARRINGTON,
Commander, U. S. N., Member.
 GEO. F. F. WILDE,
Commander, U. S. N., Member.
 C. H. WEST,
Lieutenant-Commander, U. S. N., Member and Recorder.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, April 25, 1892.

The CHAIRMAN OF THE COMMITTEE ON LOCATION:

SIR: Inclosed is transmitted to the Committee on Location, for consideration and report, the following paper relative to a uniform system of buoyage.

(1) Report dated April 17, 1892, of the Board on Uniform Buoyage, consisting of the inspectors of the Third, Fourth, and Second districts, and the assistant to the inspector of the Third district.

The return of the paper, with the report of the committee, is requested.

Respectfully,

JAS. A. GREER,
Rear-Admiral, U. S. N., Chairman.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, June 1, 1892.

The CHAIRMAN OF THE COMMITTEE ON LOCATION :

SIR: Referring to a previous letter to the Committee on Location, dated April 25, 1892, relating to a uniform system of buoyage, there are sent you inclosed the following papers for your consideration in connection therewith:

(1) Letter from the Department of State dated March 14, 1892, inclosing

(2) Copy of a note from the British minister at this capital, proposing the adoption of an international uniform system of buoyage, inclosing

(3 and 4) Two copies of a paper showing such a system.

Respectfully,

JAS. A. GREER,
Rear-Admiral, U. S. Navy, Chairman.

TREASURY DEPARTMENT, OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, June 1, 1892.

The LIGHT-HOUSE BOARD:

SIRS: The Committee on Location, to which were referred on April 25 and June 1, 1892, the papers relating to an international uniform system of buoyage, returns them with the following report:

Your committee submits the following table showing the English and American propositions in regard to a uniform system of buoyage with its recommendation in regard to each proposition in parallel columns:

Your committee also submits the following draft of a letter as an expression of the views of the Light-House Board on uniform system of buoyage.

Your committee further recommends, if this letter be adopted by the Board, that the Board take the proper measures to have it sent by the Treasury Department to the Department of State as an authoritative expression of the views of this Government, that it may be used by the Department of State as a basis for a reply to the note dated March 8, 1892, from the British minister at this capital, relating to the adoption of a uniform system of buoyage by the two countries.

Respectfully,

H. L. HOWISON,
Captain, U. S. Navy, Chairman of the Committee on Location.

TREASURY DEPARTMENT, *May 25, 1892.*

The SECRETARY OF STATE,
Washington, D. C.:

SIR: I have the honor to acknowledge the receipt of your letter of March 14, 1892, inclosing for consideration a copy of a note from the British minister at this capital, proposing the adoption of an international uniform system of buoyage.

The matter was being considered, in accordance with the recommendation of the International Marine Conference, by the Light-House Board, at the time of the receipt of your letter. Since then, by direction of the Light-House Board, four officers of the U. S. Navy connected with the Light-House Service of the United States as inspectors, and with long experience, have had the proposition of Her Majesty's Government under careful consideration and have made their report to the Light-House Board. It was found that little difference really existed between the system of buoyage used in this country and that proposed by the English Government, and it is thought that the fewer forms of buoys employed and the simpler the colors used to distinguish them, the better, and that any plan which will not eliminate many of the forms or colors used at present, would oppose the spirit which underlies the

movement to secure uniformity of buoyage. In the interest of the practical and sensible seafaring man who is to be benefited by the adoption of a uniform system of buoyage, it is a duty to reduce the variety of forms and colors of buoys to such an extent that there can be no possible confusion in these days when ships move at such high rates of speed in and out of port.

The Light-House Board has carefully kept in mind these several points, and has prepared a table (inclosed herewith) showing the English and American propositions with a column of remarks.

This Department will be much pleased if the matter can be again considered by Her Majesty's Government, the slight differences adjusted, and a common ground of agreement reached. When this has been done, this Department will be glad to recommend to Congress at its next session, the adoption of the plan agreed upon.

I have the honor to be, sir, your obedient servant,

CHARLES FOSTER,
Secretary.

Table showing the English and American propositions in regard to a uniform system of buoyage.

English.	American.	Remarks.
1. The mariner when approaching the coast must determine his position on the chart and must note the direction of the main stream flood tide.	1. The mariner when approaching the coast must determine his position on the chart and must note the direction of the main stream flood tide.	Mutually agreed upon.
2. The term starboard hand shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbor, river, or estuary from seaward. The term port hand shall denote the left hand of the mariner under the same circumstances.	2. The term starboard hand shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbor, river, or estuary from seaward. The term port hand shall denote the left hand of the mariner under the same circumstances.	Mutually agreed upon.
3. Buoys showing the pointed top of a cone above water shall be called conical and shall always be starboard-hand buoys, as above defined.	3. Buoys showing the pointed top of a cone above water shall be called conical and shall always be starboard-hand buoys, as above defined.	Mutually agreed upon.
4. Buoys showing a flat top above water shall be called can, and shall always be port-hand buoys, as above defined.	4. Buoys showing a flat top above water shall be called can, and shall always be port-hand buoys, as above defined.	Mutually agreed upon.
5. Buoys showing a domed top above water shall be called spherical and shall mark the ends of middle grounds.	5. Buoys showing a domed top above water shall be called spherical, and shall mark the ends of middle grounds.	Mutually agreed upon.

Table showing the English and American propositions in regard to a uniform system of buoyage—Continued.

English.	American.	Remarks.
<div>6.</div> <div>Buoys having a tall central structure on a broad base shall be called pillar buoys, and like other special buoys, such as bell buoys, gas buoys, automatic sounding buoys, etc., shall be placed to mark special positions, either on the coast or in approaches to the harbors, etc.</div>	<div>6.</div> <div>Pillar buoys are not used by the Light-House Establishment. Bell, gas, and automatic whistling buoys are now used. (See sec. 10.) For marking entrances and colors. (See sec. 11, as to shape and color of buoys for marking dangers with channel way on all sides.)</div>	<div>The Light-House Board believes that the several shapes of bell buoys, gas buoys, automatic whistling buoys, etc., are sufficiently numerous for such purposes, and ought not to be further complicated by additional shapes. To prevent confusion in terms, it is recommended that the word "whistling" be used instead of "sounding," which latter word is often used by mariners for other purposes, while whistling conveys but one idea.</div>
<div>7.</div> <div>Buoys showing only a mast above water shall be called spar buoys.</div>	<div>7.</div> <div>Buoys showing only a mast above water shall be called spar buoys.</div>	<div>Mutually agreed upon.</div>
<div>8.</div> <div>Starboard-hand buoys shall always be painted a single red color.</div>	<div>8.</div> <div>Starboard-hand buoys, whether spar, conical, bell, gas, or whistling, shall always be painted a single red color.</div>	<div>Practically, a mutual agreement.</div>
<div>9.</div> <div>Port-hand buoys shall be painted of another characteristic color, either black or parti-color.</div>	<div>9.</div> <div>Port-hand buoys, whether spar, can, bell, gas, or whistling, shall always be painted a single black color.</div>	<div>Practically, a mutual agreement. In the interests of navigators and uniformity of system a single black color is recommended.</div>
<div>10.</div> <div>.....</div>	<div>10.</div> <div>Special buoys, such as bell buoys, gas buoys, or automatic whistling buoys, when placed to mark the entrance to a harbor, estuary, or river, shall be painted with white and black vertical stripes.</div>	<div>This is recommended in place of the English proposition, No. 17, to prevent confusion with the spherical buoy with horizontal white stripes for middle grounds.</div>
<div>11.</div> <div>.....</div>	<div>11.</div> <div>All buoys, without regard to shape, placed to mark rocks, hidden dangers, or isolated obstructions with channel ways on all sides of them, shall be painted with red and black horizontal stripes, commencing with black at the top, and may be left on either hand in passing.</div>	<div>This is recommended, as it would seem absolutely essential that isolated dangers should have special colors for buoys used for that purpose.</div>

Table showing the English and American propositions in regard to a uniform system of buoyage—Continued.

English.	American.	Remarks.
12. Spherical buoys at the ends of middle grounds shall always be distinguished by horizontal stripes of white color.	12. Spherical buoys at the ends of middle grounds, or marking shoals in harbors or their approaches, shall always be distinguished by horizontal black and white stripes, beginning with black at the top.	Mutually agreed upon.
13. Surmounting top marks, such as staff and cone, etc., shall always be painted one dark color.	13.	Not used by the Light-House Board, and not considered advisable in American waters, top marks being exceedingly difficult to maintain without almost endless expense for repairs.
14. Staff and cone shall always be used on starboard-hand buoys, staff and cylinder on port hand. Globes at the outer end of middle grounds and half globes (round part uppermost) at the inner end.	14. Not used by the Light-House Board, and not considered advisable in American waters, top marks being exceedingly difficult to maintain without almost endless expense for repairs.	It is considered impracticable in the harbors and rivers of the United States north of Chesapeake Bay, during the winter months, to have staff and cone or staff and cylinder or globes on buoys, either for use as starboard or port hand buoys, or at the ends of middle grounds, for the reason that at this time of the year the harbors are usually filled with ice which the strongest currents in every change of the tides carry back and forth, sweeping away the buoys, often crushing them. Were top marks employed it would be impossible to maintain them, except spindles on the ends of spar buoys, which sweep under the ice and rise after it passes. (See sec. 15.) No other top marks can be employed in American waters, and it is believed that the office of the conical, can, and spherical buoys to mark the sides of the channels and ends of middle grounds are sufficiently distinctive and simple for all purposes.

Table showing the English and American propositions in regard to a uniform system of buoyage—Continued.

English.	American.	Remarks.
15.	15. Spar buoys on the starboard hand entering channels shall be surmounted by a spindle at their tops two feet high and two inches in diameter, to distinguish them from port-hand buoys, as the colors are often obliterated by ice running over them in winter.	
16. Buoys on the same side of a channel, estuary or tideway may be distinguished from each other by names or consecutive numbers or letters, commencing from seaward, and where necessary, by a staff surmounted with an appropriate top mark.	16. Conical buoys on the starboard hand of a channel, estuary, or river shall be distinguished by even numbers painted in white figures, commencing from seaward. Can buoys on the port hand shall be distinguished by odd numbers painted in white figures, commencing from seaward. No top marks. In addition to the numbers, letters or names may be used in special cases.	Practically the same, except that it is recommended that numbers shall always be used, but that letters or numbers may be used in addition in special cases. No top marks.
17. Fairway buoys shall always be painted in horizontal stripes of white color, and shall be surmounted with a staff only.	17.	The Light-House Board is of the opinion that it is an unnecessary aid in channels marked clearly by conical and can buoys and often an obstruction. In American waters these buoys are often sunk by collision. The abolition of these is recommended and the substitution of proposition No. 10 in place thereof.
18. Buoys intended for moorings, etc., may be of shape or color according to the discretion of the authority within whose jurisdiction they are laid, but for marking submarine telegraph cables, the color shall be green with the word "telegraph" painted thereon in white letters.	18. Buoys for marking submarine telegraph cables shall be colored green, with the word "telegraph" painted thereon in white letters.	Mooring buoys are not used by the Light-House Board.
19. Wreck buoys in the open sea, or in the approaches to a harbor or estuary, shall be colored green with the word "wreck" painted in white letters on them.	19. Wreck buoys in the open sea, or in the approaches to a harbor or estuary, shall be colored green with the word "wreck" painted in white letters thereon.	Mutually agreed upon.

Table showing the English and American propositions in regard to a uniform system of buoyage—Continued.

English.	American.	Remarks.
<p>20.</p> <p>When possible, the buoys shall be laid near to the side of the wreck next to mid-channel.</p>	<p>20.</p> <p>When possible, wreck buoys shall be laid near to the side of the wreck, next to mid-channel.</p>	Mutually agreed upon.
<p>21.</p> <p>When a wreck-marking vessel is used, it shall, if possible, have its top sides colored green with the word "wreck" in white letters thereon; and shall exhibit:</p> <p>By day, three balls on the yard 20 feet above the sea. Two placed vertically at one end, and one at the other, the single ball being on the side nearest to the wreck.</p> <p>By night, three white, fixed lights, similarly arranged, but not the ordinary riding light.</p>	<p>21.</p> <p>When a wreck-marking vessel is used, it shall, if possible, have its top sides colored green with the word "wreck" in white letters thereon; and shall exhibit:</p> <p>By day, three balls on the yard 20 feet above the sea. Two placed vertically at one end, and one at the other, the single ball being on the side nearest to the wreck.</p> <p>By night, three white, fixed lights, similarly arranged, but not the ordinary riding light.</p>	Mutually agreed upon.
<p>22.</p> <p>In narrow waters, or in rivers, harbors, etc., under the jurisdiction of local authorities, the same rules may be adopted, or, at discretion, varied, as follows: When a wreck-marking vessel is used she shall carry a yard on a mast, with two balls by day placed horizontally not less than 6 nor more than 12 feet apart, and two lights by night, similarly placed. When a barge or boat only is used, a flag or ball may be shown in the daytime.</p>	<p>22.</p> <p>.....</p>	The Light-House Board is of the opinion that there should be but one system of marking wrecks, and that the method described in Article 21 should, in the interests of uniformity be the only one permitted.
<p>23.</p> <p>The position in which the marking vessel is placed, with reference to the wreck, shall be at the discretion of the local authority having jurisdiction.</p>	<p>23.</p> <p>When a wreck-marking vessel is used to mark a wreck she shall be moored as near as possible to seaward of the danger, or next to mid-channel, when it can be done.</p>	The Light-House Board does not think it advisable that local authorities should have discretionary power.

REPORT OF THE LIGHT-HOUSE BOARD, 1892.

APPENDIX No. 3.

REPORT

UPON THE

ELECTRIC BUOYS IN GEDNEY CHANNEL, NEW YORK HARBOR,

BY

C. H. WEST,

LIEUTENANT-COMMANDER, UNITED STATES NAVY,

Assistant to the Inspector of the Third Light-House District.

ELECTRIC BUOYS IN GEDNEY CHANNEL, NEW YORK HARBOR.

UNITED STATES GENERAL LIGHT-HOUSE DEPOT,
OFFICE OF UNITED STATES LIGHT-HOUSE INSPECTOR, THIRD DISTRICT,
Tompkinsville, N. Y., June 30, 1892.

Capt. W. S. SCHLEY, *U. S. Navy,*

Inspector Third Light-House District, Tompkinsville, N. Y.:

SIR: In obedience to your verbal order, I have the honor to make the following report of the condition and efficiency of the electric-buoy plant in New York Lower Bay, comprising six lighted buoys in Gedney Channel and one buoy on the turning point of Southwest Spit.

The past fiscal year of 1891-'92 has seen a marked improvement in the general efficiency of the whole system, due to a careful observation of defects and a constant endeavor to eliminate them. These imperfections will be taken up under the following heads:

INCANDESCENT LAMPS.

The shape of the glass bulb in use for the 100-candle power incandescent buoy lamps from November, 1888, to September, 1891, was of the commercial oblong pattern. This shape was found to be too small for the heat given off by the spiral filament in vacuum. After being lighted twenty minutes the glass bulb was so hot that the hand could not be borne upon it. In wintry weather the icy sea water in the lantern coming in contact with the hot glass would break it and of course end at once the usefulness of that lamp.

After various experiments, a 5-inch bulb was adopted in September, 1891. This increase of size has been attended with a greatly prolonged life of the lamp and a large increase of general efficiency. The sealing of base of lamp has been changed with marked advantage from plaster of Paris to litharge. The plaster was found to retain more or less moisture in a seaway, which injured the insulation and efficiency of lamp wires.

A stronger junction has been effected between the platinum wires and the carbon, thus rendering the spiral filament less sensitive to the heavy swaying and twisting motion of the buoys in gales of wind.

The result of these improvements has been such that the expenditure of lamps has been reduced to a minimum with a greatly prolonged life. During the stormy months (September to May) of the winter of 1890-'91 there was an expenditure of 66 lamps other than by collisions, while in the winter of 1891-'92 this expenditure with the improved 5-inch lamp was lessened to 29, or 127 per cent. One of the new improved lamps had the extraordinary life of 2,407 lighted hours amidst the gales and heavy seas of Sandy Hook Bar.

Heretofore these incandescent lamps have been purchased by the dozen from the Edison Company, as this office did not feel justified in ordering larger quantities while the lamp was in an experimental stage. It is now intended, however, to buy the improved lamps in quantities of 250 and thus save a considerable sum of money

on the wholesale price. All lamps before being finally accepted by this office now pass a lighted test for twelve hours in the dynamo room of the Edison Company, and the same test for twelve hours on the lamp racks of the electric-buoy station. This tentative method discovers any imperfect workmanship or materials.

During January, 1892, the buoys were subjected to the most severe test of running ice that they have encountered since their installation. For several days they were surrounded by heavy floating ice, and at times one or more of the buoys were completely submerged for several minutes. The water froze on the lanterns of the buoys until they were enlarged to the size of barrels, but by running the dynamo a short time before sunset the heat of the current melted the ice off, and the customary night display of the lamps was not interrupted.

SUBMARINE ELECTRIC-LIGHT CABLES.

Upon the first installation in 1888 of the electric-buoy plant in Gedney Channel, New York Lower Bay, single-armored cables were used both for the single conductor (branch) and three conductor (main cables). From time to time it was found necessary to underrun these cables and examine defects, caused chiefly by anchors of vessels and by dredging steamers engaged in deepening the adjacent channels. After underrunning the cables they showed a great tendency to spontaneously fly into kinks like new manilla rope taken from the coil. This kinking opened the lay of the armor, exposed the jute packing, and in time wore away or fused the gutta-percha insulation of the copper conducting wires, which caused short circuits and involuntary extinguishment of the buoy lamps.

To overcome this objectionable feature any new cables introduced into the plant in 1891-'92 were made with a double armor. The first thus laid was of the single-conductor class with 16 wires, No. 5 B and S, for the inside armor, and 18 wires, No. 10 B and S, for the outside armor. After due trial it was found that the size of the outside armor could be advantageously increased to 16 wires, No. 7 B and S, and this size of cable was subsequently laid to the new electric buoy on Southwest Spit.

The double armor having worked well on the single-conductor cable it was also employed with the three-conductor cable, 18 wires, No. 5 B and S, being used for inner armor and 18 wires, No. 7 B and S, for outer armor. In all cases of double-armored cable the wires and insulation of the conductors have remained the same as in the single-armored cable—to wit, a strand of 7 copper wires, No. 18 B and S, insulated with three coatings of best gutta-percha, the exterior diameter of insulated conductor being 0.325 of an inch.

The surface of the exterior armor was at first coated with ordinary tar to protect it from the corrosion of salt water. But the tar was very friable and soon chafed off, leaving the iron wire almost as much exposed as if never applied. An asphalt compound called "P & B" paint, largely used on subway cables, was then substituted for the tar. It was applied to the exterior of both inner and outer armor, and as far as used has been found to afford a solid and tenacious protective shield to the iron wires of armors. This "P & B" paint is probably the bituminous residuum of petroleum dissolved in the bisulphide of carbon.

Experience has shown that the best "packing" for the insulated core, and also for the protective layer between the inner and outer armors, is formed of American long-fiber jute with a mixture of 15 to 18 per cent of best tar. Jute packing seems to be preferable to hemp packing, in that it makes a softer bed for the gutta-percha and does not indent it. The inner and outer armors are laid on with the turns in the same direction. The outer armor is made of a slightly softer wire than the inner armor. Both armors are of galvanized wire.

The double-armored cables thus made have been found to be very pliable and not disposed to kink. It is quite remarkable in what a small space the large three-conductor cable of 1½ inches diameter can be coiled down, and these new cables are as flexible as old manilla rope.

Chatterton's Compound (composed of three-fifths gutta-percha, one-fifth tar, and one-fifth rosin) is used for filling in the interstices of the seven (stranded) copper conducting wires, but is not employed now on the outside of the gutta-percha insulation, as in the first cables made. If these interstices are not thus filled up with this compound, water is apt to creep into the hollow, finally leading to short-circuiting and other evils.

During the summer of 1891 the single-armored three-conductor cable supplying the red lights on the north side of Gedney Channel having been found faulty as to insulation, caused in a great degree by dredging operations, it was decided to replace a portion of the northern part with new double-armored cable. Accordingly, on November 10, 1891, 7,920 feet of new double-armored three-conductor cable were laid from the north junction box to a point just to the southward and westward of the axis of the South Channel, where it was spliced into the old single-armored three-conductor cable. The length of this new cable is shown by the letters A B on the annexed chart of the locality. The old cable for the above distance was taken up and returned to this depot and its best parts will be used for subsequent splicings.

The two main three-conductor cables having been found chafed more or less by the rocks near the beach at the north end of Sandy Hook, 800 feet of white light (south) cable were replaced by double-armored cable on April 26, 1892, and 600 feet of the red light (north) cable on May 25, 1892. These new lengths are indicated respectively by the letters C D and E F on the chart.

The general condition of the gutta-percha insulation of the submarine cables after nearly four years' service has been found in a good state of preservation. In the opinion of the writer pure gutta-percha is superior for submarine work to the various combinations of rubber, gutta-percha, etc., known in the market as "kerite," etc. Moreover, gutta-percha is spliced with much greater facility in a seaway than the various combinations of rubber and gutta-percha—a paramount consideration where splices are made in open boats exposed to heavy weather.

Annexed is a table of the different sizes, etc., of submarine cables made experimentally and otherwise for the electric-buoy plant since its installation. The letters refer only to the sequence in their time of manufacture. These letters have since been retained to identify any special type.

SOUTHWEST SPIT ELECTRIC BUOY.

For some years past there has been a great demand from the pilots and masters of heavy-draft vessels plying to the port of New York that the turning buoy (No. 12) on Southwest Spit, New York Lower Bay, be indicated at night by some sort of light. By reference to the chart it will be seen that there is a sharp right angle turn in the main ship-channel from Bayside Range to Chapel Hill Range and *vice versa*.

To enter fair on the Chapel Hill Range a heavy-draft vessel has to make a detour more or less with a starboard helm after passing the northern part of Sandy Hook, and then with a port helm gradually bring the vessel to the exact entrance of Chapel Hill Channel. The range lights of Conover Beacon and Chapel Hill Beacon in a right line indicate this entrance. These lights, however, are at times more or less obscured by mist or smoke. As it is a "back" range entering New York the maneuver at night of passing just between the buoys, a width of about 900 feet, in a vessel drawing over 20 feet is an exceedingly delicate and dextrous piece of seamanship. A slight divergence either way may run a heavy-draft vessel on Southwest Spit or into the comparatively shoal water of the west side. Even in the daytime with all landmarks and buoys in plain sight, I have seen several steamers when leaving or entering New York touch the ground in the shoal water to the southward and westward of the range of the South Beacon on with the Sandy Hook main light. Long steamers with single screws make this right angle turn with great difficulty.

On account of this embarrassment in rounding Southwest Spit many masters of heavy-draft vessels, after passing Sandy Hook at night through the lighted highway

of Gedney Channel, have preferred to anchor until daylight in Sandy Hook Bay rather than take the above-described risk of grounding on Chapel Hill entrance. This delay by anchorage means an absolute and serious postponement of the delivery of their mails at the New York post-office, which in the long winter nights might amount to some ten hours. If, however, a steamer by the various aids to navigation is enabled to steam in from sea around Southwest Spit directly to the quarantine station off Stapleton, Staten Island, the delivery of the mails is immediate to a tug at that point which at once takes them to New York City. Therefore, as far as mails are concerned, the goal of European "flyers" to New York is the quarantine station on Staten Island.

For the above reasons a lighted buoy was so much needed on Southwest Spit that preparations were made in May, 1892, to establish an electric buoy. On June 2, 1892, a single conductor double-armored cable, 10,214 feet long, of the "F" pattern, was laid from a sandy cove, just to the northward of the docks of the U. S. Army on the northwest side of Sandy Hook, to the red spar buoy (No. 12) on the west side of Southwest Spit. Its characteristic is fixed red, being left on the starboard head entering New York. From the landing point on the beach to the dynamo of the electric-buoy station is a distance of 600 feet, which space is traversed by two overhead wires on six telegraph poles for the direct and return current. One dynamo generates ample current for all seven buoys of the plant, and the current is carried with perfect safety by the conductors in the cables, the stranded copper wires being in electric conductivity equal to a solid copper wire one-tenth of an inch in diameter.

This electric buoy was first officially displayed on the night of June 15, 1892, and its installation has been received with marks of the greatest approval by the pilots of New York and masters of heavy burthen steamers plying to that port. The first-class nun buoy (red, No. 12), with perch and ball, has been retained alongside of the electric spar buoy, as the latter is not sufficiently conspicuous for a day mark in strong tides and fresh winds.

The submarine cables for the electric-buoy plant have thus far been made by the Bishop Gutta-Percha Company, of 420 East Twenty-fifth street, New York City. The long and varied experience of that company, combined with the intelligent and conscientious assistance of the general manager, Mr. Henry A. Reed, have resulted in producing cables which meet the perplexing and difficult conditions of their surroundings near Sandy Hook.

ELECTRIC SPAR BUOYS.

After long experience at Sandy Hook the opinion still remains good that the best buoys to bear the electric cable are made from juniper (cedar) wood procured from North Carolina. They are not quite so strong as white pine buoys in event of being run down by passing steamers, but their marked buoyancy holds up the electric lantern to a great height, and so increases its range of visibility. The candle power of the incandescent lamps being 100, they should be visible, by the ordinary rule, about 10 miles, if sufficiently elevated to surmount the curvature of the earth. There is not sufficient water in Gedney Channel to float a spar high enough to fully overcome this curvature. However, from the bridge of a vessel of ordinary burthen the white lights of Gedney can be seen from Sandy Hook light-vessel on a clear night, a distance of about 5 nautical miles. The red-lighted buoys are visible about half this distance, as the medium of the red glass in the lantern obscures a high percentage of the light.

The buoys become water soaked in about six months, when they are taken up and replaced by dry ones from the depot. These buoys are about 50 feet long, although shorter ones ride to better advantage on the north side of Gedney Channel, as there is less water to float them there than on the south side.

The small single-armored "A" cable three-fourths inch diameter, is laid in a score in the buoy from lantern to heel and the score is covered by a strong wooden batten. About 2 feet above the heel the "A" cable is spliced into the double armored single conductor "branch" cable leading to junction box. About the heel of buoy is secured a heavy wooden collar to prevent chafe of cable on the iron band of the heel. The buoys are securely anchored by cast-iron sinkers weighing 5,000 pounds. Annexed is a sketch showing the dimensions of improved juniper buoy which has been found to stand up well.

CHANGES IN AIDS TO NAVIGATION.

In connection with the electric buoys it is proper to note recent changes in aids to navigation which are adjuncts to Gedney Channel. With the introduction of long and deep-draft steamers it was apparent that some radical changes in the positions of the buoys and light-vessels about Sandy Hook entrance were necessary.

In 1823, when Sandy Hook light-vessel was established, it was, of course, located in a position most suitable for sailing vessels to readily sight in making Sandy Hook entrance. Since the remote period of its establishment steamers of great size have gradually monopolized the commerce of New York, and their needs for easy access to that harbor must be considered as mandatory.

These steamers, on account of their great draft, are obliged to use Gedney Channel, therefore all floating aids to seaward of that entrance should be placed, when practicable, in positions which may lead these large vessels most safely and easily to the entrance of Gedney. The former position of Sandy Hook light-vessel lay to the southward and eastward, and at an acute angle with the axis of Gedney Channel, so that after a steamer had run close to the light-vessel, as it might have to do in thick weather, it then approached Gedney at an acute angle.

The buoys of Gedney Channel might not be made out until close aboard, rendering a rapid change of helm necessary for entering, and, as long steamers with single screws do not turn in a short space, several grounded on either side of Gedney Channel sea entrance. To overcome this inconvenience of location, Sandy Hook light-vessel in 1891 was moved $2\frac{1}{2}$ miles NE. by N. from her old location and established on the direct axis of Gedney Channel, about 5 miles from the seaward electric buoys. From the new position of the light-vessel steamers pass on a direct course without radical change of helm to Gedney Channel entrance.

For a more appropriate position Gedney Channel Whistling Buoy was moved on the same axis. As the entrance buoy to Gedney Channel was unlighted and really an obstruction to vessels entering at night, it was discontinued and a large first-class nun buoy and first-class can buoy placed on either side of the seaward entrance close to the outer electric buoys. These iron buoys accentuate the entrance to the channel when the spar buoys might be bowed down by strong ebb tides and northwest winds.

The Scotland light-vessel was also moved a short distance to the northward and eastward on the axis of the South and Swash channels. Several additional buoys were placed along Flynn Knoll and Southwest Spit to more completely delineate that dangerous locality in thick weather. A complete change throughout the district was made in the system of buoyage by placing nun buoys on the starboard hand entering from the sea, and can buoys on the port hand, as required by the statutes of the United States. The sequence of all buoy numbers was revised, so as to afford a speedy and intelligent method of identifying them while passing in vessels.

CHANGES AND REPAIRS AT STATION.

The steam launch *Bouquet* having proved to be too small for winter use at the Hook, it was removed and a large second-hand steam launch of the steamer *Armeria* substituted. During the year a bell fog-signal tower was erected on the northwestern

extremity of Sandy Hook, and the duty of attending it was assigned to the keeper of the buoy station, extra compensation being given therefor.

In the work of repairs the station has been largely self-sustaining. The labor of overhauling the cables, boilers, and engine, painting buildings, laying walks, and raising electric-light poles has been done by the keepers.

Mr. W. C. Humstone, of the Western Union Telegraph Company has been exceedingly courteous in gratuitously granting the services of the cable boat *Western Union* to lay new submarine cables on November 10, 1891, and June 2, 1892. The rapid and precise method of laying cables from this boat reflects great credit upon its appointments and skill of the master. The cable to Southwest Spit, about 2 statute miles in length, was thus laid in fifteen minutes with the greatest facility.

In the past year Mr. W. L. Brown, in charge of the electric-buoy station, has rendered most intelligent and zealous service. Masters G. H. Goddard, E. C. Ruland, and G. E. Mathews, in charge of tenders, have been most efficient in handling submarine cables and the large buoys.

UTILITY OF THE ELECTRIC-BUOY PLANT.

I can not speak too highly of the general usefulness of the electric-buoy plant. Its great worth has been fully demonstrated in the past four years by the marked increase of vessels using this lighted highway at night. By the figures of the annexed tables it will be seen that since the establishment of the plant the increase per month of vessels entering the port of New York through Gedney Channel is 85 per cent; and the increase per month of vessels leaving by the same channel is 167.50 per cent. This percentage speaks for itself. Anyone doubting the usefulness of the plant has only to view after nightfall this lighted path from Gedney Channel to Southwest Spit, and I am sure the most skeptical and captious person would then become an enthusiast as to the system.

This installation possesses an advantage over range lights in that the latter, to be sensitive, have to be placed some distance apart, which fact implies more or less obscurity of the lights in weather which is not clear. Moreover, the positions of the electric buoys can also be modified at any time to accord with the deepest water in the channel. Range lights, on account of the rigidity of their establishment, can determine only one right line of entrance, and thus do not possess the elasticity of location granted by the rapid and inexpensive shifting of electric buoys.

The proposed installation of the electric-buoy plant was viewed with doubt and misgiving by the seafaring community of New York, as it was feared that the buoy lights would blind the eyes while directing a vessel's course through the channel. Fortunately, however, the incandescent light, while possessing most of the luminous qualities of the arc light, is not handicapped by the latter's intense glare, uncertain reflection, and deep shadows. Contrary to these conservative predictions of some seafaring people, the buoy lights were an immediate and positive success from the first night of their display, and have since steadily increased in the estimation and confidence of all mariners who pass Sandy Hook.

The established success of the Gedney Channel buoys was followed by the wide demand for an electric light on Southwest Spit and its subsequent installation as noted above. So important and necessary have these lighted buoys become to pilots that I consider any premeditated discontinuance of the system would lead to a protest from the vast commercial interests of New York not less vehement than the outcry which would follow the abandonment of any first-order seacoast light. In these days of rapid transit between the emporiums of the world, when all the ingenuity of modern research, the power of wealth, and the energy of man are devoted to abridging a 3,000-mile voyage by a petty but all-important hour, it is self-evident that the enlightened policy of the Light-House Board to thus hold wide open the gates of Sandy Hook is in intelligent accord with that same spirit of enterprise and progress. For the solicitous master of a steamer, who in this task of emulation has passed

anxious days and nights in speeding his vessel across the ocean's highway, it is indeed an encouragement and solace to be confident that the rapidly approaching coast is surrounded by every safeguard known to science to mitigate the dangers and happily lead him to the desired haven.

Very respectfully,

CLIFFORD H. WEST,
Lieutenant-Commander, U. S. Navy,
Assistant to Inspector of the Third Light-House District.

TABLE I.—Showing the number of vessels using the Gedney Channel, between sunset and sunrise, in 1888, 1889, 1890, 1891, and 1892.

[Officially reported by the New York Maritime Exchange operator, Sandy Hook, N. J.]

Year and month.	Bound in.	Bound out.	Total.	Remarks.
1888.				
December 4-31.....	24	18	42	
1889.				
January.....	30	9	39	
February.....	24	2	26	
March.....	26	13	39	
April.....	81	4	35	
May.....	20	6	26	The weather during May and June was very foggy.
June.....	16	1	17	
Total.....	171	53	224	
1889.				
July.....	15	3	18	
August.....	17	3	20	
September.....	14		14	Weather very foggy.
October.....	40	14	54	
November.....	41	29	70	
December.....	45	43	88	
1890.				
January.....	38	23	61	
February.....	25	12	37	
March.....	32	12	44	
April.....	34	17	51	
May.....	39	16	55	
June.....	37	20	57	
Total fiscal year July 1, 1889, to June 30, 1890.	377	192	569	
1890.				
July.....	35	27	62	
August.....	29	27	56	
September.....	26	24	50	
October.....	42	33	75	
November.....	67	34	101	
December.....	52	35	87	

TABLE I.—*Showing the number of vessels using the Gedney Channel, between sunset and sunrise, in 1888, 1889, 1890, 1891, and 1892—Continued.*

Year and month.	Bound in.	Bound out.	Total.	Remarks.
1891.				
January	89	80	69	White Star steamer <i>Celtic</i> passed in Jan. 17 at 1 a. m., in abet and bad storm.
February	82	23	55	
March	88	12	50	
April	41	20	61	
May	36	19	55	Steamship <i>Furst Bismarck</i> passed in May 16 at 12:15 a. m., in fog.
June	83	13	46	
Total fiscal year July 1, 1890, to June 30, 1891.	470	297	767	
1891.				
July	29	10	39	
August	30	16	46	
September	28	23	51	
October	46	21	67	
November	70	87	107	
December	61	31	92	
1892.				
January	59	24	83	
February	54	26	80	
March	42	12	54	
April	49	18	67	
May	32	15	47	
June	33	19	52	
Total fiscal year, July 1, 1891, to June 30, 1892.	533	252	785	

SYNOPSIS.

Fiscal year of.....	1888-'89 7 months.	1889-'90.	1890-'91.	1891-'92.
Total number of vessels—				
Coming in	171	377	470	533
Going out.....	53	192	297	252
Total	224	569	767	785
Average per month—				
Coming in	24	31.4	39.1	44.4
Going out.....	8	16.0	24.7	21.6
Total	32	47.4	63.8	66.0

Per cent of increase per month, 1891-'92 (66.0) over 1888-'89 (32) is 104.87 per cent.

TABLE II.—Patterns and sizes of submarine cables used in the electric-buoy installation, New York Lower Bay.

[Sizes by B. and S. wire gauge. Cables made by Bishop Gutta-Percha Company, New York City, from 1887 to 1892.]

Patterns.	Conductors.	Each copper conductor (stranded).		Armors.	Inside armor (iron).		Outside armor (iron).		Outside diameter.	Weight per statute mile (5,280 feet).	Remarks.
		Wires.	Size of wires.		Wires.	Size of wires.	Wires.	Size of wires.			
AA.....	1	3	19	1	None.		18	7	1.1	6,843	Used for experiment only.
A*.....	1	7	18	1	None.		12	7	0½	5,280	Used in buoy only.
B.....	3	7	18	1	None.		16	4	1¼	10,890	Original main cables.
C.....	1	7	18	2	16	5	18	10	1½	15,023	Used from heel of buoy to junction box.
D*.....	3	7	18	2	18	5	18	7	1½	25,184	New main cables.
E.....	1	7	18	2	16	5	18	7	1½	20,668	Used from heel of buoy to junction box.
F*.....	1	7	18	2	16	5	16	7	1½	19,113	Used from heel of buoy to junction box; also to Southwest Spit.

* Latest pattern adopted.

TABLE III.—List of machinery, etc., electric-buoy station, Sandy Hook, N. J.

Two vertical cylindrical boilers, 3 by 7 feet. Each has 71 2-inch tubes. Made by E. P. Hampson, New York City.

Average steam pressure	pounds..	80
Maximum steam pressure	do..	100
Horse power with average steam pressure.....		8
Horse power with maximum steam pressure.....		10
Worthington duplex feed pump.....		1
Armington & Sims's high-speed engine		2
Size of cylinders	inches..	5 by 7
Edison dynamos, compound wound, of special type, Schenectady, N. Y.....		2
(Each dynamo generates 165 volts and 29 ampères on average work.)		
Ammeter (total current) Ayrton & Perry.....		1
Line ammeters (Bergmann)		8
Line resistance boxes		7
Resistance boxes (total current)		2
Voltmeter (Ayrton & Perry)		1
Imhauser's pole indicator		1
Wheatstone bridge		1
Chloride of silver battery.....		1
Submarine cables and line wires (approximate measurement, statute miles):		
Gedney Channel buoys:		
Three-conductor cables	miles..	5½
Single-conductor cables.....	do...	3
Southwest Spit:		
Single-conductor cable.....	miles..	2
Line wires:		
To Gedney Channel (1,500 feet), insulated overhead wires		7
To Hook Beacon (1,500 feet), insulated overhead wires.....		1
To Southwest Spit (600 feet), insulated overhead wires.....		2

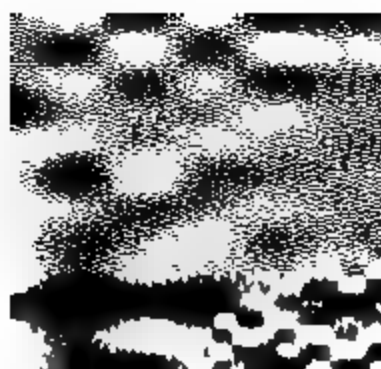


Exhibit "A"

SUBMARINE CABLES
for
ELECTRIC BUOYS

ANNUAL REPORT

Lieutenant Commander
Clifford H. West, U.S.N.
July 1st 1892.



'D' CABLE

3 Conductor (Main) cables.
outside Diameter $1\frac{1}{2}$ "

Double Armored.

Inside armor 12 wires #5

outside armor 16 wires #7.

Weight of 5280 feet = 25 18 $\frac{1}{2}$ lb.

'F' CABLE

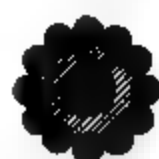
3 Conductor (Branch) cables
outside Diameter $1\frac{1}{2}$ "

Double Armored:

Inside armor 16 wires #5

outside armor 16 wires #7

Weight of 5280 feet = 19.113 lb



'A' CABLE

1 Conductor (Buoy) cable
outside Diameter $\frac{1}{2}$ "

Single armor

of 12 wires #7.
Weight of 5280 feet = 3280 lb

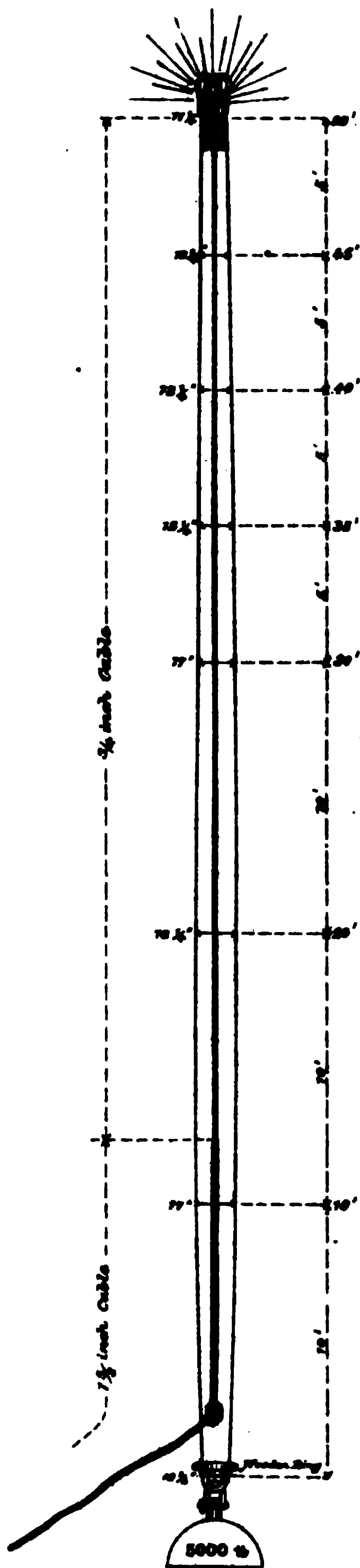
Each Conductor in cable 7 Wires (stranded) #18

Insulation of Gutta-Percha . full Diameter $\frac{325}{1000}$

Packing of Jute

Wire gauge. B.L.S.

Exhibit B

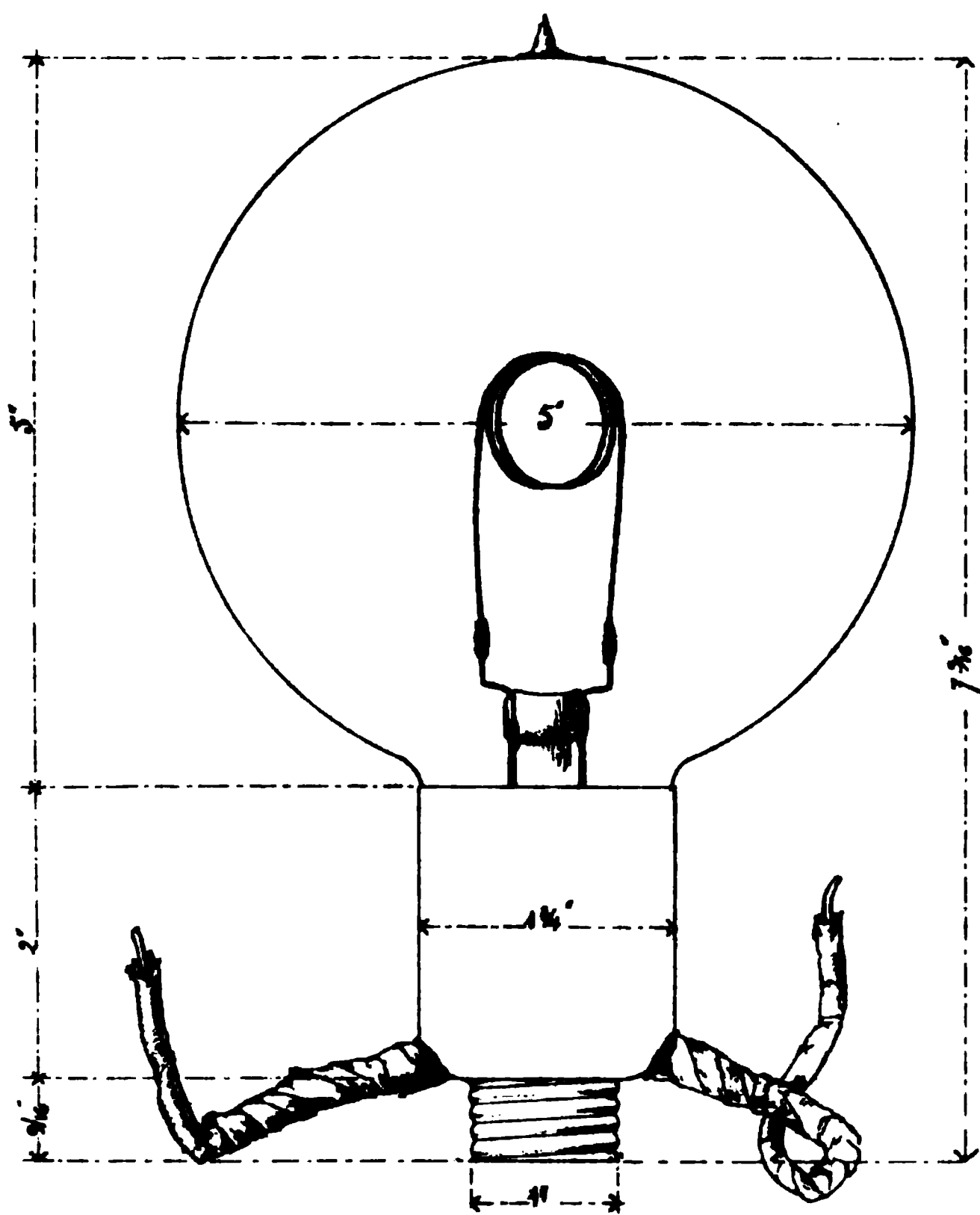


ELECTRIC SPAR BUOY
with Cast Iron Sinker
JUNIPER (CEDAR) WOOD.

A

[illegible]

Exhibit "C"



INCANDESCENT
LAMP
for
ELECTRIC BUOY

RT
nder

Red
Cable
for
Sector.

Red
Cable
HANNEL
White
Cable
White

No. 4.

ANGE
SHORE

PART OF
WER BAY
ORK HARBOR

ELECTRIC LIGHTED BUOYS
IN
EY CHANNEL
AND
SOUTH-WEST SPIT

RED SIGNAL NO.

FORT

LIFE SAVING STA.

MAIN LIGHT

red cable

74° 00' 00"

73° 57' 00"

REPORT OF THE LIGHT-HOUSE BOARD, 1892.

APPENDIX No. 4.

REPORT

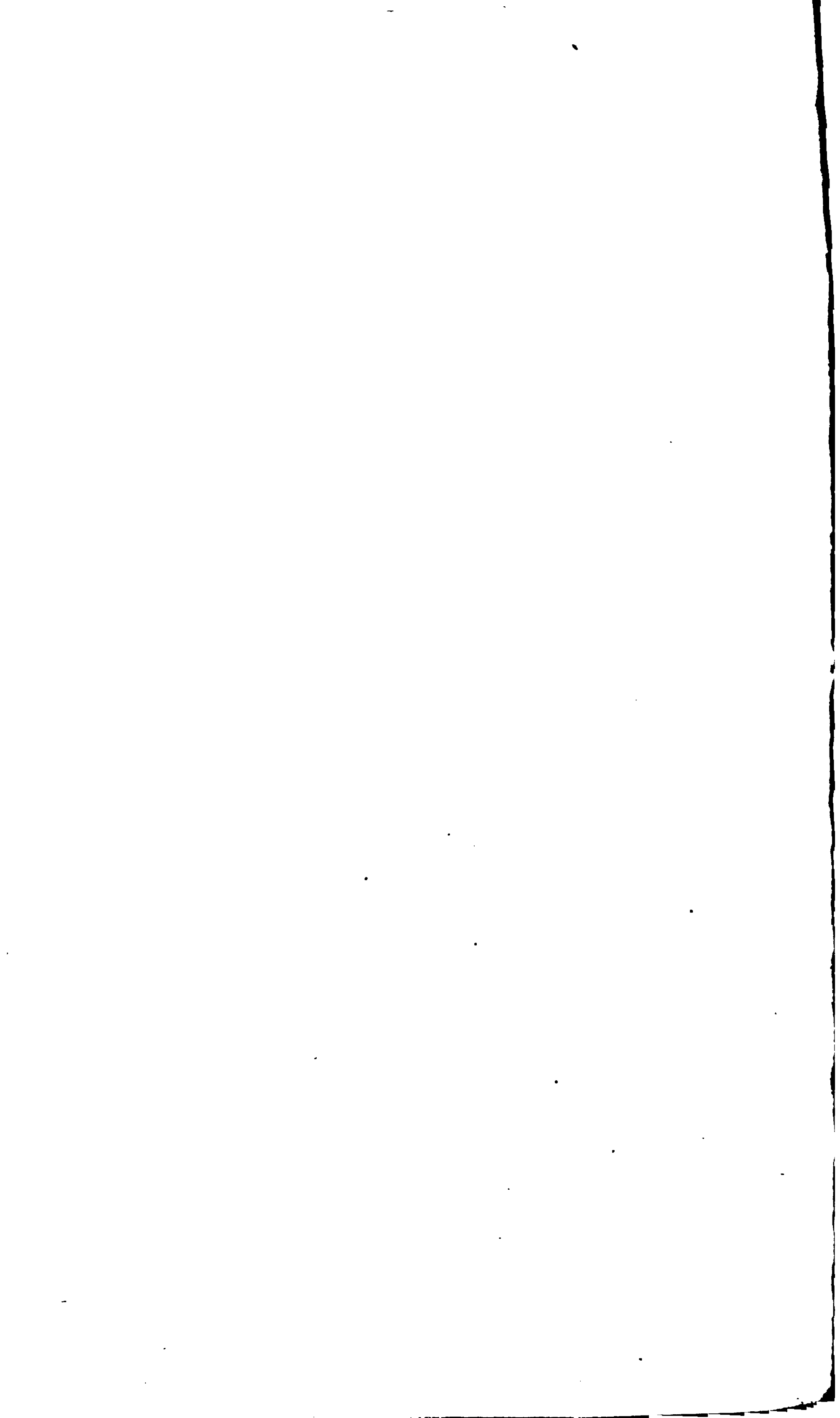
OF

DAVID PORTER HEAP,

MAJOR OF ENGINEERS, U. S. A.,

ENGINEER, THIRD LIGHT-HOUSE DISTRICT,

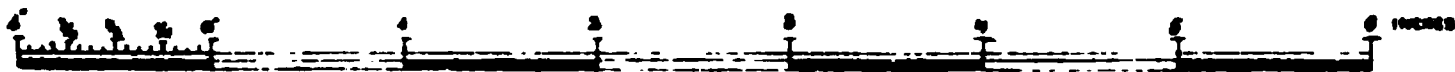
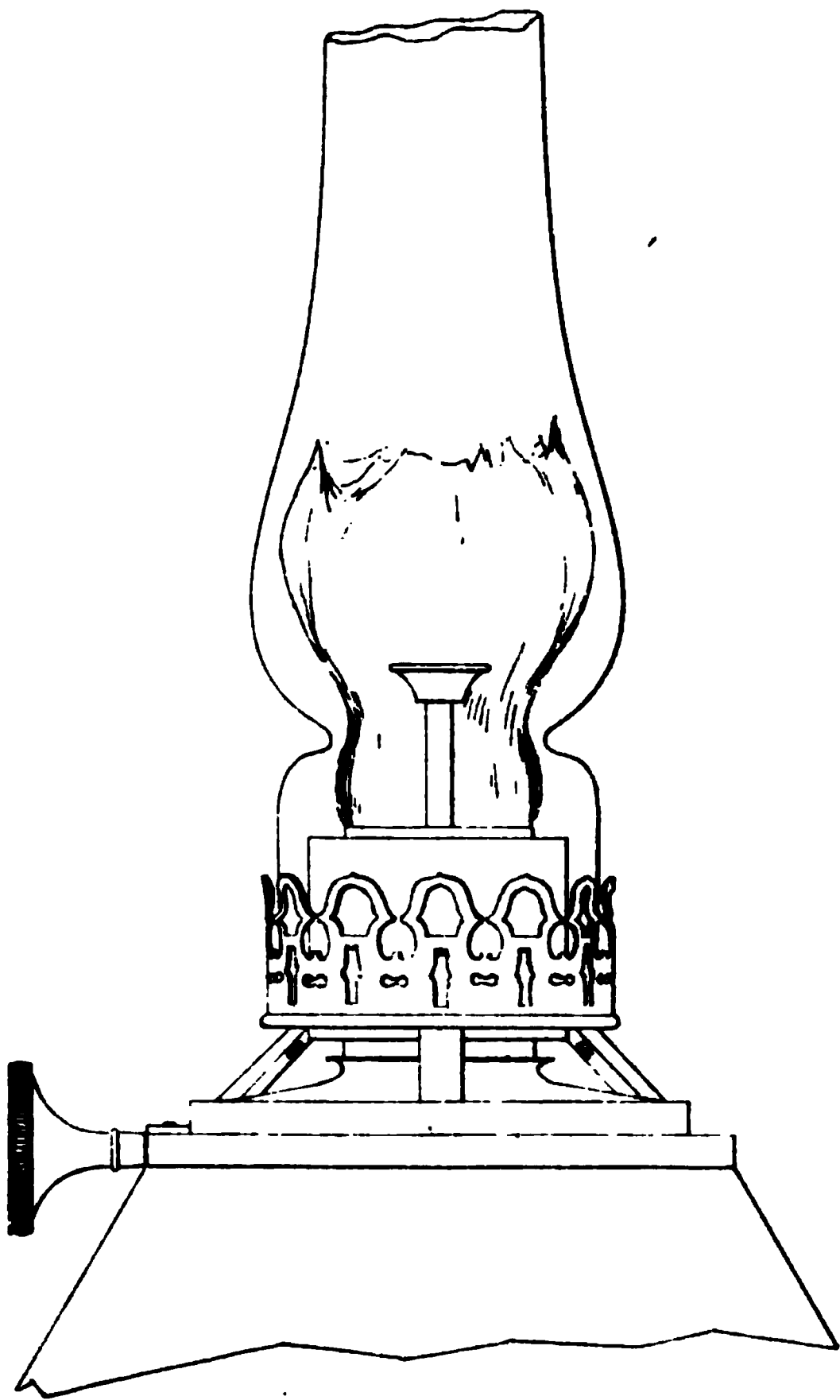
UPON SOME RECENT IMPROVEMENTS IN AIDS TO NAVIGATION,
AND A DESCRIPTION OF THE NEW METHOD OF
LIGHTING THE STATUE OF LIBERTY.



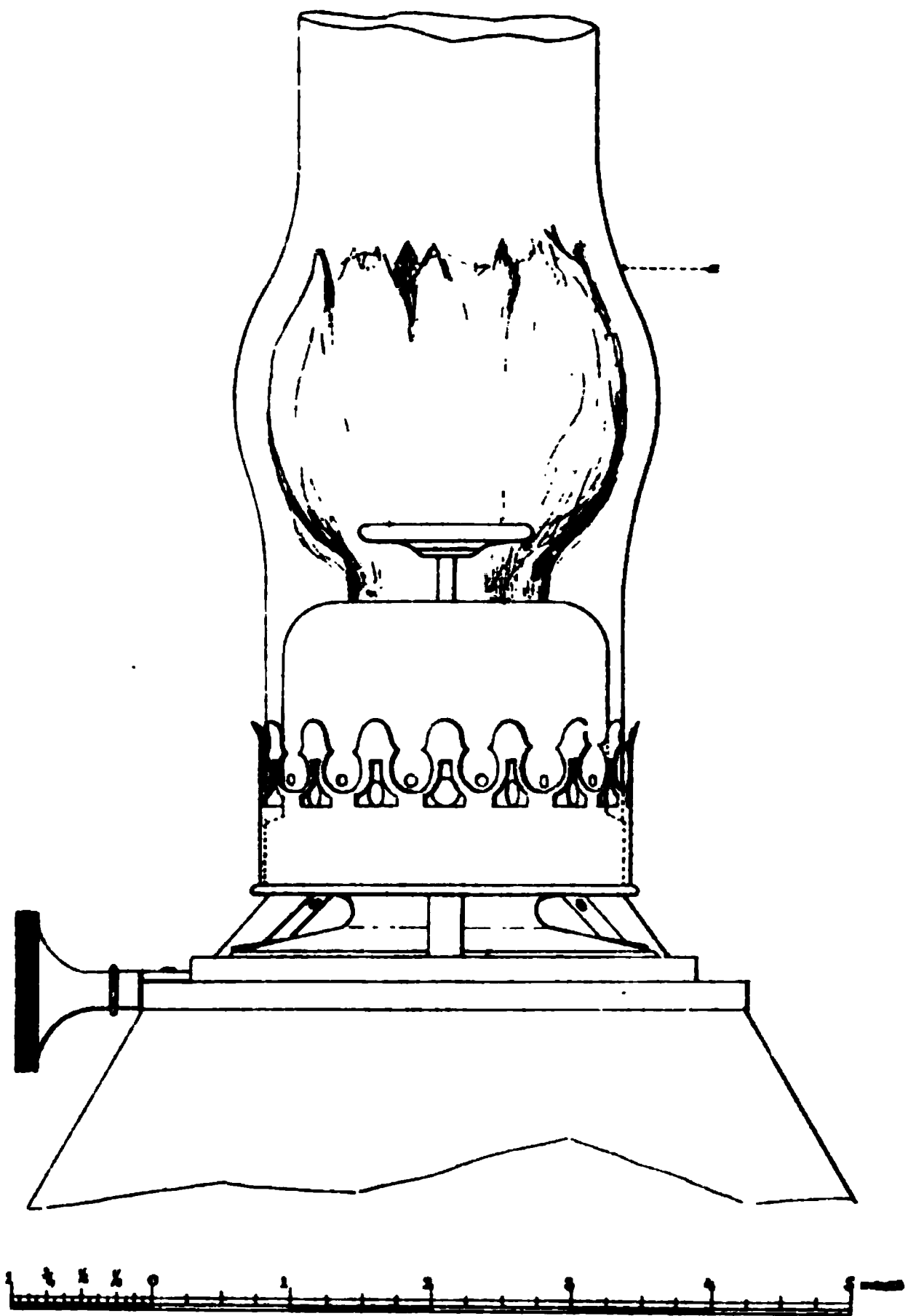
FUNCK-TUBULAR LAMP

5th & 6th Order.

Burner.



FUNCK HEAP
.4th Order Mineral Oil Lamp
Burner.



SOME RECENT IMPROVEMENTS IN AIDS TO NAVIGATION.

During the last five years a number of improvements in aids to navigation have been made at the light-house depot, Staten Island, New York.

A description of what has been accomplished may be of interest.

I.—LAMPS.

The reason for existence of a light-house is the light it gives; as a rule the stronger the light the more valuable the light-house; so, naturally, my attention was first drawn to this point. I found that the Fresnel lenses used to concentrate the rays from the flame of the lamp were about perfect and that the illuminant in general use, kerosene, was the best and cheapest that could be procured, the only thing capable of improvement being the lamp itself. So I went to work to make a better lamp, if possible.

I first purchased and tested every good lamp which I could find in the market. Many of them were excellent and gave a better light than the existing light-house lamp; still they had their defects for light-house use. In some the flame was of too large diameter to suit the focus of the lens; in others it was too long; in several it was troublesome to put in new wicks; others heated badly; in short, none were quite right.

Mr. Joseph Funck, the foreman of the lamp shop at this depot, had devised a burner which gave excellent results with but one exception: the chimney would get coated with a white deposit within an hour after lighting the lamp, and this seriously reduced the brilliancy of the light.

Various attempts were made to cure this defect, but without avail. The excellent qualities otherwise of Mr. Funck's burner were due in a great measure to a strangled chimney and a button (see sketch), which contracted the flame immediately below the button and caused the flame to spread above it; this ensured good combustion. It occurred to me that the same result might be obtained with a different-shaped chimney combined with a brass cone to strangle the flame. Many shapes of cones were used, and I finally made one which seemed to answer every expectation (see sketch): The light was brilliant, the combustion was perfect, and there was but little, if any, deposit in the chimney. I thought that the problem had been solved and left the lamp burning. On visiting it, three hours later, I found to my disgust that the chimney had been melted at "a," where the flame was nearest to the chimney.

In studying this matter over I thought that if I could introduce a cool current of air between the flame and the chimney it would turn the points of the flame inward and protect the chimney. To do this, I bored some holes around the base of the cone, and after numerous attempts succeeded in so proportioning the size and shape of the cone, the size and height of the button, and the number of holes in the base of the cone, that I obtained a steady globular flame, more brilliant than any light of its size heretofore used in the Light-House Service and specially adapted for use in fourth-order lens apparatus.

The accompanying sketch shows a section of this lamp, known as the Funck-Heap lamp. It has been adopted by the Light-House Board and is replacing the old lamps as rapidly as it can be manufactured.

Mr. Funck's lamps of a smaller size gave excellent results and the chimneys did not whiten, probably because the heat was not so intense, so, on my recommendation, the Board adopted them for the fifth and sixth order lenses. The gain is as follows:

	Candle power.		
	Fourth order.	Fifth order.	Sixth order.
Old-style lamps.....	28	18	12
Same in lens.....	409	225	114
New lamps.....	52	38	38
Same in lens.....	592	298	278

A more detailed account of these experiments is given in the annual reports of the Light-House Board for 1888 and 1889.

II.—RED CHIMNEYS.

The characteristic of many of our lights is red, or flashing red, the color being obtained by using chimneys made of red glass. These chimneys are much more expensive than white ones and break more readily. Without incurring a large outlay I could not obtain red strangulated chimneys for Mr. Funck's lamp nor red "Belgian" chimneys for the Funck-Heap lamp; I therefore tried the experiment of surrounding the white chimney with a ruby glass cylinder, and found it answered the purpose. It was not broken by the heat, and in addition protected the white chimneys from drafts. This method of changing the color has been adopted by the Board. Formerly a year's supply of red chimneys was 100, costing \$45; now the year's supply is 6 red cylinders, costing \$5.40.

Experience has shown that the red cylinders are seldom broken except by carelessness.

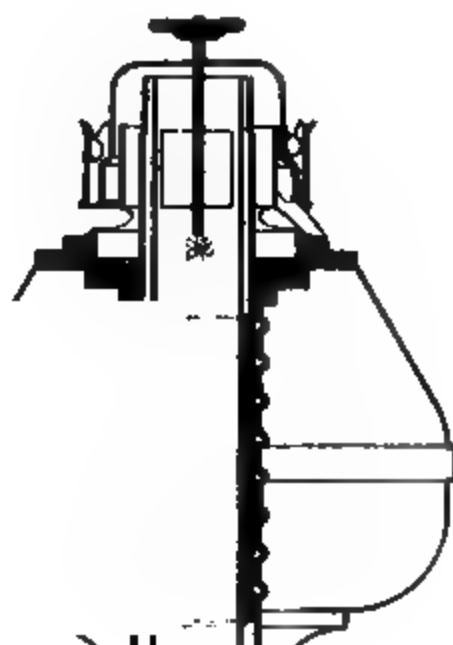
III.—LENS LANTERNS.

Some seven or eight years ago the tubular lanterns, mostly used for post lights on rivers, were modified at this depot so that they would burn at least eight days without attention. This modification consisted of adding a reservoir which fed the oil automatically to the lamp, on the principle of the German student lamp. These lanterns were successful in principle, but they were sometimes blown out in high winds and gave but a feeble light, as the lamp had only a small, flat wick, and the lens was imperfectly made of pressed glass. The light was only equal to 18 candles.

I saw no reason why the same principle should not be applied to a better lantern, with cut-glass prisms, and made several, both with and without the reservoir, using the central belt of old disused sixth-order lenses to concentrate the light, and one of Mr. Funck's lamps of 32 candle power. They were entirely successful and were not blown out by the highest winds, and gave a light equal to 180 candles, more powerful than the old lamp in a sixth-order lens.

Without a reservoir they will burn eighteen hours; with it, for three days brilliantly, and for two days longer with diminished intensity. They can be placed anywhere, on a post or platform; can be exposed in any weather; are inexpensive to maintain, and make good substitutes for sixth or even fifth order lights. The fact that they can be depended on to burn for five days makes them specially valuable for localities difficult to reach in stormy weather. Eighty-five were in use on June 30, 1891, in the various districts, and the number is increasing yearly. In addition, they make excellent running lights for steamers. They are colored red and green

FUNCK HEAP
4th Order Mineral Oil Lamp
Vertical Section.



1

2

3

4



for the port and starboard lights by the use of red and green glass globes, the same as are used with the fourth-order Funck-Heap lamp.

Full description is given in the Board's Annual Report for 1889. Their official name is "Lens Lantern," and their cost is \$125.

By the use of improved lens and tubular lanterns, and the consequent employment of inexpensive means to display them, the Board was enabled to dispense with costly light-houses to mark the St. Marys River ranges, Michigan, and thus to reduce the estimated cost from \$60,000 to \$30,000.

As the tubular lanterns were liable to be extinguished in high winds, the Board directed that experiments be made with lanterns without tubes. Mr. Funck devised a lantern which, so far, has given excellent results. It has no chimney; is simply and strongly made of brass, and costs less than the tubular lanterns. It can be arranged, with a reservoir, to burn at least eight days. I would suggest the name of "post lantern" for these.

Brass tubular lantern:

	Cost.
White	\$15.50
Red	18.00

Brass post lantern:

White	13.00
Red	15.50

Brass post lantern, with reservoir:

White	21.35
Red	23.85

IV.—OCCULTING LIGHTS.

Many of our harbor lights are of ample intensity to be seen as far as required, but, owing to the multiplication of electric and other bright lights in their vicinity, it is confusing and difficult to distinguish between the light-house and the commercial lights. This difficulty can be overcome by making the harbor lights flashing, but such a change would entail great expense, as new and more expensive lens apparatus would have to be substituted for that now in use. I thought that the same object could be obtained by making the lights "occulting;" that is to say, by automatically obscuring the light at intervals with an opaque screen. This was first tried in practice on a small light on the Fairhaven Bridge, between Fairhaven and New Bedford, Mass., which only had to be seen in one direction. I modified an ordinary revolving clock so that it would alternately open and close, at short intervals, a set of light sheet-iron vertical shutters in front of the light. When the shutters were closed the light was invisible; when opened, the light could be seen (see sketch). This plan, though well adapted for this particular light, would not answer for one which must be seen all around the horizon.

A light of this kind is the one in Newport Harbor, Rhode Island. Here another method was used. I modified an old clock, formerly used for pumping lard oil to a lamp, so that it would raise and lower a brass cylinder around the chimney. This gave the desired effect. Since then I have made clocks especially adapted for the purpose, retaining the use of the brass cylinder. These clocks are so made that the eclipses and flashes may be as frequent as desired, and their lengths regulated at will.

Seven of these new occulting lights are now in use at Tawas, Mich., Point Hueme, Cal., Ship John Shoal, Cross Ledge, Brandywine Shoal, Fourteen-Foot Bank, and Delaware Breakwater (front) Range, Delaware Bay. Others are being constructed for the front ranges in Delaware River.

The following is a description of the apparatus (see sketch):

The occultations are caused by the clock alternately raising and lowering a brass cylinder surrounding the chimney of the lamp and guided by rods. The upper part of the chimney is permanently obscured by a brass sleeve.

To the upper ring of the lens is attached an arm; the ring and arm each carry two pulleys; two ends of a metal cord are fastened to the cylinder and pass over these pulleys; to the bight of this cord is fastened another cord, the other end of which is fastened to the quadrant Q. The length of this cord is such that the cylinder will obscure the light completely when the quadrant is in the position shown in the sketch. When the clock is set in motion the wheel A will revolve in the direction of the arrow, and one of the projections P will come in contact with a cam shown in dotted lines on the shaft S, and revolve the quadrant in the direction of the arrow, thus pulling down the cord, raising the cylinder, and showing the light. The trigger T will catch in a notch N and hold the quadrant until one of the pins p release the trigger, when the cylinder will fall, obscuring the light, and its weight will bring the quadrant to its original position, ready for the operation to be repeated. The thumb-screw B on top of the clock operates a clamp by which the clock can be stopped at any moment by turning it to the right. When the lamp is lighted the clock should be stopped when the cylinder is in its highest position, in order to prevent the confined heat from melting the chimney.

The speed of the clock can be regulated by changing the position of the fans F.

The wheel A will revolve once in twenty or thirty seconds, according to the position of the fans, and each revolution will cause 10 flashes and 10 eclipses.

A fourth-order flashing light costs as follows:

Lens, including duty.....	\$1, 100	to \$1, 250
Pedestal	20	20
Service table.....	13	13
Clock.....	120	120
Set of lamps	45	45
Total	1, 205	to 1, 448

A fourth-order occulting light costs as follows:

Lens, including duty.....	\$700	to \$800
Pedestal	20	20
Service table.....	13	13
Clock.....	150	150
Set of lamps	45	45
Total	928	to 1, 028

In this connection the following letter is submitted:

PHILADELPHIA, PA., *October 14, 1892.*

Maj. D. P. HEAP, U. S. A.,

Engineer Third Light-House District, Tompkinsville, N. Y.:

SIR: In reply to your letter, I have to inform you that the occulting lights recently placed at Ship John Shoal, Cross Ledge, Fourteen-Foot Bank, and Brandywine Shoal stations, have given entire satisfaction.

Ship John Shoal, Cross Ledge, and Brandywine Shoal lights were formerly fixed lights, and they were frequently mistaken at first, more particularly the light at Ship John Shoal, for vessels' lights.

The occultations of the lights now in use enable navigators to identify them as soon as they are observed. The light at Fourteen-Foot Bank was a light of very short flash, so that the bearings of it could be obtained with difficulty, and during the flash it was impossible to discern whether the vessel was in the red or white sector. Now there is no difficulty.

I think these eclipsing lights mark a distinct advance in the light-house system.

Respectfully,

P. F. HARRINGTON,

Commander, U. S. Navy, Inspector Fourth Light-House District

V.—FOG-SIGNALS.—SIRENS.

Undoubtedly the siren is one of the best fog signals. Its penetrating though exceedingly disagreeable note can be heard farther than any other sound, except perhaps an explosion, and to it can be given any desired characteristic. Yet of the 255 fog signals of various kinds in the United States, not including whistling and bell buoys, but 18 sirens are now in use. The reason is the expense. There is but one firm in the world that makes them, so this firm has the monopoly and charges accordingly. I will say, however, that it is justified in so doing, as it spent a great deal of money in perfecting this instrument.

A siren is a simple enough instrument. It consists of two superposed disks, with a certain and like number of holes. One disk is stationary, the other revolves, while at the same time air or steam is forced through the holes. When the holes are opposite each other, the steam will pass; when they are not opposite, the passage of the steam is stopped. Hence, when one of the disks revolves the steam passes in a series of puffs. If these puffs succeed each other with sufficient frequency a note is produced rising in pitch with the rapidity of revolution and increasing in power with the pressure of the steam. In the present siren the disks are revolved by a small steam engine, which also opens and closes a valve to allow for the passage of the steam, and thus gives what is known as the characteristic, for a siren used as a fog signal does not sound continuously, but gives a certain number of blasts of a definite length per minute.

The steam is supplied by a boiler both for the engine and siren, and, to avoid possible breakdowns, the boilers, engines, and sirens are always in duplicate. The steam pressure is ordinarily about 50 pounds, and the sound can be heard from 10 to 15 miles, and occasionally much farther, depending on the weather.

The same firm which makes the sirens makes also a very much cheaper and nearly as effective an instrument, known as the "self-acting siren," which requires no engine and which is much used on the transatlantic steamers in place of steam whistles.

The steam itself revolves the disks, and the blasts are given by simply opening the valve by hand. The speed of revolution of the disks is automatically regulated by an ingenious centrifugal brake. A self-acting siren would make an admirable fog signal if it could be given a characteristic automatically. This is accomplished by the use of the "Crosby signal," a clockwork device, which can be set to automatically open the steam valve any definite number of times per minute, the clock being also wound up automatically each time the siren is blown.

One of these fog signals has lately been installed at Execution Rocks light-station, Long Island Sound. It consists of two locomotive boilers with their accessories, two self-acting sirens, and two Crosby signals, so arranged that either boiler and either Crosby signal can actuate either siren. The sound has been heard a distance varying from 8 to 17 miles.

The cost of a first-order siren in duplicate, without boilers, is \$4,800. The cost of the self-acting siren and Crosby signal in duplicate, without boilers, is \$925. I expect to reduce this to \$750.

An incidental advantage with the self-acting siren is the decreased amount of fuel and water used, as there is no engine to eat up the steam. Another similar apparatus will shortly replace the two sirens at Sandy Hook. The Crosby signals are manufactured at this depot, the Light-House Board having bought the patent.

VI.—DABOLL TRUMPETS AND HOT-AIR ENGINES.

At a number of light-stations Ericsson hot-air engines are used to compress air to sound what is known as a Daboll trumpet.

The trumpet contains a heavy steel tongue or reed, which is set in vibration by air at the proper pressure, and produces a powerful sound. The engine pumps the air into a tank and also opens a valve to the trumpet at suitable intervals, thus giving the desired characteristic to the blasts.

Delamater & Co., who manufactured these engines, have gone out of the business, and all their patterns were lost in a fire. The engines themselves are clumsy, bulky, and troublesome to keep in repair. The great advantage is their safety, their economy in fuel, and the fact that they need no water—an important consideration in many cases. A new fog signal was needed at Penfield Reef light-station, Long Island Sound, in place of the bell; so, after making a number of experiments with the Rider hot-air engine, I recommended to the Board to try it at this station. This apparatus has been installed. It consists of two Rider engines, one tank for compressed air, one countershaft, and one Daboll trumpet. On the countershaft is a worm, which revolves a gear and cam wheel; the latter tips the lever and regulates the characteristics. The first day I tried this signal I heard it $9\frac{1}{4}$ miles; others have heard it $12\frac{1}{4}$ miles. It requires a pressure of from 4 to 6 pounds to sound the trumpet. The engine burns 10 pounds of coal per hour, costing at present 1.7 cents. The total cost of the apparatus is about \$2,000, while that of the previous engine and trumpet was \$3,600.

VII.—BELLS ACTUATED BY MACHINERY.

The 355 fog signals in use in the United States on January 1, 1892, are divided into the following classes:

Sirens	18
Steam whistles.....	65
Daboll trumpets	12
Fog bells actuated by machinery.....	160

The fog bell actuated by machinery consists of a bell weighing about 1,200 pounds and a powerful clockwork actuated by a heavy weight of about 700 to 1,000 pounds. This is wound up every two or three hours and causes a hammer to strike the bell a predetermined number of blows per minute—the more frequent the blows the more rapidly does the clock run down and the more frequently does it have to be rewound. The apparatus complete with bell costs about \$600. A break of any part of the mechanism disables it and involves the necessity for immediate repair. There are thirty or more moving parts in the clock and hammer, about a dozen of which are delicate and subject to injury. Its advantages are in its small first cost and economy of maintenance, as the keeper winds the clock and thus furnishes the motive power. Its objections are its liability to injury, and, a more serious one, its small range.

A bell may be heard under favorable circumstances for 4 or 5 miles. Ordinarily its range is about a mile and it can not be depended on for a greater distance than a half mile. When I tested the new hot-air signal at Penfield Reef, I had the bell rung at the same time. I lost its sound at a distance of a mile and a half, while I distinctly heard the trumpet for $9\frac{1}{4}$ miles. The weather on this occasion was favorable for hearing sounds.

VIII.—SMALL SIRENS.

I believed it possible to make a small siren which could be heard farther than a bell, whose first cost would be less, and which would have the additional advantage of giving a greater number of blasts per minute than it is now possible to give blows with the bell without very frequent winding. It would have but few moving parts, none of them delicate. It consists of a hot-air engine actuating a centrifugal blower, a siren, and a device for regulating the blasts. The first cost is \$500 and the expense of fuel per hour while running is 1 cent. This apparatus has hardly passed out of the experimental stage, but, so far as I have heard, there is nothing of its size which makes so much noise. It is yet to be tested and compared with a bell to determine which has the greater range. The results so far, however, are so promising that it is not improbable that it may even replace the Daboll trumpet with a large saving in cost. It has this great advantage over any signal which uses steam or compressed

air: the blasts may be as frequent and the intervals as short as desired, while with the latter, the pressure being reduced at each blast, the interval between blasts must be of such a length that the boiler or engine may have time to get up the required pressure again.

The only serious objection to this apparatus is the time required to get the engine in operation after starting the fire. This will vary from thirty to forty-five minutes, depending on the draft. The time, however, can be much shortened if the keeper will maintain a small fire during the prevalence of winds likely to bring fogs. I believe this apparatus would be well adapted for use on light-vessels. If the light-vessel should already be provided with a boiler, the blower and siren could be easily operated by a small steam engine, with much less fuel and water than are now used to blow a whistle. The engine could also be used for pumping purposes when the fog signal was not in operation. If there were no boiler the hot-air engine could be used, in which case no fresh water would be needed and 1 ton of coal would be sufficient to run the fog signal for about two weeks continuously.

DESCRIPTION OF THE NEW METHOD OF LIGHTING THE STATUE OF LIBERTY.

When the statue of "Liberty Enlightening the World" was erected on Bedloe Island, New York Harbor, it was found that no provision had been made to show a light, except possibly through the windows forming the diadem.

The statue consists of an iron skeleton covered with a copper skin and stands on a granite pedestal in the center of Fort Wood.

In the daytime it is a most commanding figure, as it is of colossal size, the combined height of pedestal and statue being 305 feet.

At night it would be invisible unless illuminated by artificial means. The very name of the statue almost imperatively demanded that it should exhibit a light, and as the right hand carries a torch from which flares an immense copper flame, the most natural thing to do was to make the flame luminous.

Various methods were proposed; one was to place electric lights on the balcony surrounding the flame, which, by reflectors, would throw their light on the flame, while the direct light would be screened from the eye of the observer.

This might have answered fairly well had the flame been gilded, but one serious objection was that these outside lamps would be exposed to all weathers.

On September 28, 1886, Lieut. John Millis, Corps of Engineers, U. S. Army, was directed to report to Maj. Gen. J. M. Schofield, to assist in the preparation of a suitable plan. On October 11, he submitted a project, which, in brief, was as follows: I copy from his report:

"The plan proposed contemplates exhibiting a powerful electric light from the torch to be visible around the entire horizon, and such an arrangement of lamps and reflectors at the salients of the fort as to throw light directly on the statue and pedestal, besides the necessary illumination of the interior of the statue and pedestal and the engine and boiler rooms."

In order that the light placed inside the torch should be seen, it was necessary to provide openings, so two rows of circular windows, like port lights of a vessel, was made in the copper flame. This plan was approved and was so promptly carried into effect that everything was in readiness for the inauguration ceremonies which took place on November 1, 1886. Mr. Bartholdi visited the island on that night and expressed himself as entirely satisfied with the effect of the illumination. He appreciated the difficulty of making the statue itself visible by reflected light owing to its dark color and had certain ideas in addition, in regard to its illumination, as will appear from the following extract of a letter from him to the Hon. W. M. Evarts, dated January 5, 1887.

"As regards the question of the light, the subject of many controversies, the public has been somewhat surprised because the statue had been beforehand represented white and shining in the dark as if silvered, while such an effect is impossible, as the dark color of the copper will absorb all the light. I believe the determination taken to be excellent, and the luminous fire in the hand very logical and happy an effect.

"At the beginning a project had existed to throw light from above the flame, where an opening had been provided, and to direct vertically towards the skies a halo that would be perceived a long distance. The idea was also proposed to make the diadem luminous by lighting the inside of the head."

THE STATUE OF LIBERTY.



VERTICAL SEC'

He also wrote Lient. Millis on April 28, 1887:

“The only effective lighting is to place a powerful light in the hand. I know that such a light seen from a distance will resemble any other light; that is, look like a powerful star, and the public might possibly desire something more original.

“Should you then wish to give such a feeling satisfaction in this respect, I think the head might be provided with a supplementary light, which shooting through the diadem openings would usually produce a very decorative radiance. Perhaps it might be a revolving light. A further idea would be to represent in the diadem openings, by means of stained glass, so well made in America, the national stars of the United States.

“This addition to the lighting would likely give a very original and peculiar aspect to the statue light. That in the hand, being very powerful, would be seen from far, while the other in the head would be a decorative complement visible in the whole harbor. Such is the only suggestion I would allow myself to make, because the lighting of the statue by projection appears to me a useless expense unless someone would afford the luxury of plating the statue with gold or some shining metal.”

Experiment has shown that the project of placing a light in the head does not have the effect anticipated by Mr. Bartholdi, the appearance is simply that of another light below the one in the torch.

The effect of the side lamps is to illuminate quite satisfactorily the pedestal, which is of a light-colored granite, and to bring out the details of the statue when the observer is close to it.

If the statue were painted white it would be seen very clearly and I believe the effect would be very striking, especially at night, and in addition it would check the corrosive action of the copper which has already taken place, as shown by the green streaks on the pedestal. I was anxious that the method of lighting should be improved, and at the same time to carry out, as far as practicable, the ideas of the artist. I submitted my views to the Light-House Board; they were approved, and in consequence the following has been done:

92.

[Notice to Mariners—(No. 90, of 1892.) United States of America—New York.]

LIBERTY ENLIGHTENING THE WORLD.

Notice is hereby given that, on or about October 21, 1892, the following changes will be made in the lights and illumination of the Statue of Liberty Enlightening the World, inside Fort Wood, Bedloes Island, New York Bay, New York.

In addition to the light now shown from the torch there will be a vertical beam of red and yellow light seen only by reflection from the haze or dust in the air.

The face and bust of the statue will be illuminated by a powerful search light from one of the salients of the fort.

The coronet will be decorated with red, white, and blue incandescent electric lights.

The pedestal will continue to be illuminated, as heretofore, by arc lamps within the salients, and not visible outside the fort.

By order of the Light-House Board.

JAMES A. GREER,
Rear-Admiral U. S. Navy, Chairman.

OFFICE OF THE LIGHT-HOUSE BOARD,
Washington, D. C., September 30, 1892.

As will be seen by the “Notice to Mariners” the day for the first exhibition was that set apart by the President as a national holiday.

The flame originally contained nine arc lamps of about 2,000-candle power each, and these could only be seen through the circular windows previously mentioned.

Of course, a very large proportion of the light is wasted, and the observer can only see that which streams through the window opposite to which he happens to be. The nine lamps are now replaced with one self-focusing lamp of 5,000-candle power, and for the circular windows is substituted a glazed belt of plate glass 18 inches high. Inside the flame are mirrors made of aluminum reflecting a portion of the light horizontally and the rest of it in a vertical beam through a skylight, glazed with red, white, and yellow glass, the different colors giving it somewhat the effect of a flame. The aluminum mirrors are corrugated, and the light reflected from their numerous faces seems to be of a diameter as large as the copper flame, and no longer looks like a bright point or star.

The making and fitting of the frame to hold the glass forming the glazed belt was the most troublesome and difficult part of the whole plan. It was done by first making templates of the flame where the upper and lower rings were to go. These rings were then made in four pieces, and fastened securely outside the flame to the iron frame inside by means of bolts passing through the copper. After this was done brass sash-bars were screwed diagonally to the rings, the copper was then cut away between the rings, and the glass panes put in. The sketch will show how irregular in shape these rings had to be, and what sort of a cut-and-try job it was.

The lighting of the coronet or diadem was considerably simpler, fifty incandescent lamps of 50-candle power each are used and the globes surrounding them have the national colors. There are twelve red lights in the center, then six white ones on each side and thirteen blue ones over each temple. This effect is that of a crown of jewels composed of rubies, diamonds, and sapphires. The reason that there are so few white lights compared to the colored ones is because there is so much loss of light due to the colored glass, and it was desired that all of the jewels should be equally well seen.

A diadem with the face invisible would lose the greater part of its charm. Yet, with all the lights in the salients of the fort throwing their beams on the statue, Liberty remains modestly out of sight at night. To partially overcome this a powerful search light has been placed in one of the salients of the fort, and throws its beam directly in her face. Now, every night, she may be seen with flaming torch, flashing diadem, and face illumined, gazing forth over the noble waters of New York Bay.

HEAD OF STATUE, SHOWING LIGHT ON CORONET.

REPORT OF THE LIGHT-HOUSE BOARD, 1892.

APPENDIX No. 5.

REPORT

UPON THE

CONSTRUCTION OF NORTHWEST SEAL ROCK (ST. GEORGE REEF)
LIGHT-HOUSE, SEACOAST OF CALIFORNIA.

BY

MAJOR W. H. HEUER, U. S. ARMY,

Engineer of the Twelfth Light-House District.

CONSTRUCTION OF NORTHWEST SEAL ROCK (ST. GEORGE REEF) LIGHT-HOUSE, SEACOAST OF CALIFORNIA.

OFFICE OF THE U. S. LIGHT-HOUSE ENGINEER, TWELFTH DISTRICT,
San Francisco, Cal., January 1, 1892.

J. W. H. HEUER,

Corps of Engineers, U. S. Army, Light-House Engineer, Twelfth District:

SIR: I have the honor of reporting the successful completion of Northwest Seal Rock light-station early in November, 1891.

The site of this station is on Northwest Seal Rock, being the outermost danger St. George Reef, a cluster of rocky islets and sunken rocks projecting in a westerly direction from Point St. George about $6\frac{1}{2}$ nautical miles long and from 1 to $1\frac{1}{2}$ miles wide.

Inside the reef, close under Point St. George, is a deep wide channel used by north-bound steamers, but only in daylight and clear weather.

The position of Point St. George, midway between Capes Mendocino and Blanco, would naturally suggest it as a suitable location for a first-class light, and the present site being about 6 miles outside of the headland gives it a decided preference over the mainland.

The superficial area of the rock above low-water line is about 40,000 square feet, in an oval form, with a ridge running from east to west, the highest point being about 100 feet.

On April 3, 1883, a working party left San Francisco in the schooner *La Ninfa*, a vessel of 137 tons register, chartered for use as a workmen's quarters at the rock. The party, numbering twenty-five, consisting of crew, quarrymen, stonecutters, and a blacksmith, with an outfit of provisions, fresh water, and the necessary tools, were towed by the wrecking steamer *Whitelaw*, having on board four sets of moorings, consisting of one 12,000 pounds mushroom sinker and three of 8,000 pounds, four spar buoys, some 200 fathoms of chain $2\frac{1}{4}$ inches for bottom lengths and $1\frac{1}{2}$ inches for upper lengths. After a stormy passage, the steamer having put back twice, with her tow, to San Francisco, she succeeded in making Northwest Seal Rock on the morning of April 9, and laid the big 12,000 pounds mooring and made the schooner fast in spite of a heavy sea which was running at the time.

Concerning the depth of water in which the moorings would be placed there was unfortunately some doubt, the only data available being some soundings taken by the light-house tender's boat in 1881. The depth assumed from this being about 18 fathoms, and as it turned out 30 fathoms, our spar buoys were far too light. Our only recourse was to get larger ones. The steamer at once proceeded to Humboldt Bay, the nearest point where such sticks could be procured. None suitable being found on land, it was necessary to have them brought from the woods. This delayed the steamer until April 27, on which date she left Humboldt, arriving at Northwest Seal Rock on the 28th, to find the schooner gone and no trace left of our big moorings.

The weather being fine we laid the other three moorings with the new buoys, the steamer cruised in the vicinity of the rock, awaiting the reappearance of the schooner until May 3, when we again went to Humboldt Bay to communicate with Capt. Payson, the light-house engineer.

On our arrival in Humboldt Bay we learned from the brig *Josephine* that she had sighted and spoken the *La Ninfa* during a gale off Cape Mendocino on April 30. After coaling the *Whitelaw* we immediately put to sea in search and fell in with the missing schooner on the morning of May 6. We then learned she had first been driven north, then south, in her endeavors to hold in the vicinity of the rock, having parted an 8-inch hawser during a gale on the night of April 22, leaving about 50 fathoms attached to the spar buoy, the weight of which and the strong current running carried the stick to the bottom. The *Whitelaw*, although provided with special appliances for dragging, failed to pick up the lost mooring. She was discharged after two days' unsuccessful work.

Arrangements for supply and communication were then made with the coasting steamer *Crescent City*, making trips about once every ten days.

On May 9 we made the first landing on the rock, got in ringbolts, rang spring line, and made the schooner fast; on the 10th we got our powder ashore and began drilling on the north side for preparation of the site of the pier. The weather continuing fine until the 12th, we rigged a traveler of 2½-inch wire rope, made fast to a ringbolt on the top of the rock and passed between the masts of the schooner to a spar buoy moored on the outer side of the vessel, the fore and main throat halyards being hooked onto the wire so as to take out the sag, a traveler block with endless line being used in taking men and tools on and off, and thus making landings when too rough for a surf boat.

The wire was raised and lowered as desired on board and the surging motion of the vessel allowed by the oscillation of the halyard tackles, the hooks of which were made fast to the wire by a strap; this prevented undue wear on the rope by permitting it to render through a block.

On June 9 the *Whitelaw* came and replaced the head mooring; after this was done the schooner was hauled in close to the rock permanently for the season, making the distance from the vessel to the top of the rock about 300 feet. The wire cable worked excellently, only parting once as the men were getting into the cage on the rock, letting them fall a few feet, but doing little damage except a few bruises.

The southerly winds, accompanied by heavy seas, which prevailed during April and May, changed early in June to violent northwesterers, so that little progress was made until the 1st of July. By the end of August the benches, 10 feet wide around the outline of the pier, were roughly formed by blasting, and only needed the finishing off by stonecutters to complete them. In addition space was blasted for water supply allowing a storage capacity of 77,000 gallons of fresh water.

On September 28 the entire work of preparation of the site was completed and ready to receive the masonry. All tools and men were taken aboard. The weather, which had been fine for a few days, changed to a strong southerly gale. The steamer *Crescent City* came on October 2 and took the workmen to San Francisco. The *La Ninfa* left under sail, having a sufficient crew aboard. This concluded the first season's work on the rock. The working force was then disbanded in San Francisco and the tools stored on Yerba Buena Island.

In the fall of 1883 drawings and specifications were prepared for a wharf, workmen's quarters, and stonecutters' shed on the North Spit, Humboldt Bay, for use in accurately dressing the stone before shipping it to the rock. Bids were invited for the erection of these structures, and the contract let to the lowest bidder, Mr. James Simpson, of Eureka. Work was commenced during December.

While in Humboldt, on business connected with the construction of the depot, Mr. Simpson, the contractor, called my attention to a deposit of granite just discovered on Mad River, about 5 miles north of Humboldt Bay. I at once visited the location and found a deposit of granite boulders of a good quality, and making a careful estimate of the quantity in sight I thought we possibly might get enough for the completion of the light-house. I at once communicated the information to the light-house engineer, who secured the stone at a royalty of 4 cents per cubic foot, and entered into a contract with the owner of the railroad for transportation.

from the quarry to the stoneyard at the rate of \$2 per ton, and also made a contract with Mr. Simpson to build quarters at the quarry for \$700.

During the spring of 1884 work was pushed at the quarry and stoneyard so as to have a few cargoes of cut stone ready for shipment to the rock. About the 1st of May the steamer *Whitelaw* was chartered and sent to Humboldt Bay, with heavy backing anchors, and took aboard a large boom derrick. She proceeded to the rock and set the moorings, and, taking advantage of the fine weather on July 2, we got the derrick placed in position and secured. The dimensions of this derrick were as follows: Mast, 20 by 20 inches by 50 feet long; boom, 20 inches diameter in the slings by 90 feet long, with two stiff legs 78 feet long. At the same time the schooner *American Boy*, a vessel of 178 tons, was chartered and fitted up in Humboldt Bay, to be used for workmen's quarters at the rock.

As the appropriation act of July 7, 1884, contained only \$30,000 for Northwest Seal Rock work was at once suspended and both vessels discharged, as work on the rock could not be carried on advantageously at a less expenditure than \$15,000 per month, or say \$75,000 for the season. A force of from 12 to 20 quarrymen and laborers and from 8 to 10 stonecutters were employed at the quarry and stoneyard until October 31, 1885, when they were discharged and the property placed in charge of a watchman.

To provide against further deterioration of plant and the possible loss of the big derrick, a working force was sent from Humboldt Bay, and a steamer chartered which spent the month of June, 1885, in raising all the moorings except one, which was replaced and rebuoyed, the big derrick was also secured against possible loss from its exposure to the heavy seas. During the time the vessel was thus engaged the outline of the pier was marked off with brass brads placed at the center of each stone, header and stretcher.

An appropriation of only \$40,000 being made for the work by the act of March 3, 1885, the idea of running work at the rock in the spring of 1886 was abandoned, and as no appropriation was made in 1886 no work was planned with the available funds other than the necessary care of property.

On the closing of the work in the fall of 1885 the result of what had been done at the quarry and stoneyard were as follows:

Dimension stone quarried	cubic feet..	5, 439
Backing quarried	do....	4, 450
Dimension cut (220 blocks)	do....	5, 994
Backing cut	do....	9, 006
Total dimension stone on hand	do....	15, 052
Total backing on hand	do....	23, 138
Total dimension stone on hand, cut	blocks..	419
Number of dimension stone on hand, uncut	do....	133
rough backing quarried on hand	cubic feet..	6, 000

Thus far but one season's work had been done at the rock in preparing the site during the summer of 1883, at a cost of \$46,009.17. During 1884 the sum of \$9,500 was spent in laying moorings and preparing for the season's work, which was worse than useless, as it cost about \$6,000 in 1885 to lift these moorings and taking precautions for the safety of the plant erected the season before.

In four years only one working season of about one hundred working days was utilized advantageously on the rock. During a part of this four years other attempts were made to work on the rock, but on account of small and insufficient appropriations expensive plant had to be hired, property and plant which we had and which for lack of appropriations could not be used, deteriorated by exposure, rot, and rust, all of which combined to make the first four years of the work unduly expensive.

An appropriation of \$120,000 having become available March 4, 1887, authority was given for preparing and laying stone by hired labor, for the purchase of plant in open market, and charter of vessels necessary on the best terms obtainable.

Specifications were also prepared under which it was proposed to advertise for bids for transporting the building materials from the depot at Humboldt Bay to the rock.

At the quarry the winter rains had washed down an immense quantity of earth encumbering the railroad tracks, derricks, and stone partly quarried. The main pile of dressed rubble (about 1,500 tons) left on the hill side convenient for shipment, slid bodily and embedded itself in the soft soil at the base of the hill.

At the stoneyard the piles supporting the wharf were completely destroyed by teredo so that it was necessary to practically rebuild it. Work was pushed to the utmost at the two points during March and April, getting affairs in shape, in the preparation of spar buoys, derricks, etc., and in overhauling and renewal of rigging and plant deteriorated or destroyed during two years disuse.

The *Sparrow*, a schooner of 200 tons, was chartered in Humboldt Bay and fitted up with eating and sleeping quarters for 50 men. A large assortment of tools, rope, blocks, chain and ironwork, together with a powerful steam winch for handling material, were shipped by the steamer *Santa Maria*, from San Francisco, on April 5, arriving at Humboldt on the 7th. Owing to continued bad weather and the unfinished state of the wharf at the stoneyard the steamer was delayed until the 12th when she left for the rock with a load of moorings and men. All the moorings on board were set and the steamer returned on May 1, taking on board more moorings which she was unable to carry on the first trip. She again sailed on May 10, with the schooner *Sparrow* in tow, arriving at the rock on the 11th. By the 18th we had six sets of moorings finished. The balance of the month was spent in erecting four boom derricks and a large hoisting engine, and in building a wharf or landing for receiving materials at the rock.

The mast of the big derrick, which had been left on the rock, we found had been cracked by a blow from a sea some 40 feet above high water, and had to be fastened with heavy iron bands.

In the meantime bids had been received for the transportation from the stoneyard to the rock. Two bids were received, viz, the steamers *Santa Maria* and *Alliance*. The *Alliance* being the lower by \$10,000, she was employed.

The *Alliance* arrived at Northwest Seal Rock with her first cargo of building materials and stonemasons on June 4. I found she was not properly rigged for handling the heavy stone and at once put our own riggers aboard and had her suitably rigged for the service.

I also reported to the light-house engineer that the steamer was unfit to carry out her contract, as she neither had the power nor carrying capacity to complete the work during the season available. The steamer *Santa Maria* was then rechartered for \$7,000 per month and both vessels were kept on for the season ending October 31.

This season (1887) was remarkable for the prevalence of strong northwest winds, the whole summer being a succession of heavy gales, making construction difficult and dangerous, as the workmen had to be taken on and off daily between the schooner and the rock, but no accident happened to the men nor was any material lost.

During a gale in the month of June a stone weighing 3½ tons was torn from its place some 30 feet above sea level and thrown on a bench above; the stone was solidly set in cement mortar for twelve hours, but the men were unable to put in the day, having to leave the rock in consequence of the heavy sea.

At the close of the season's work, on October 3, we had raised the pier to a height of 18 feet, being eight courses of stone exclusive of the zero course, which was 4 feet high, making a total of 22 feet in height.

The small force of men which had been employed at the quarry and stoneyard getting out and dressing stone during the fall of 1887 and the spring of 1888 were discharged in March of the latter year, and the work entirely suspended for lack of funds.

An appropriation made March 30, 1888, becoming available in April, two vessels

were chartered, namely, the wrecking steamer *Whitelaw* and the steam schooner *Del Norte*. The *Whitelaw*, being required first, sailed from San Francisco on April 19, with men, chain for moorings, rigging, tools, etc., arriving in Humboldt Bay on the 22d, making a poor passage owing to strong head winds. After taking aboard lumber for landing and men's quarters on the rock, riggers and carpenters at Humboldt, we sailed for Northwest Seal Rock on April 26.

The weather being favorable we finished the wharf, with quarters under it to accommodate 50 men, erected derricks and large hoisting engine, and reset the moorings, all being ready when the *Del Norte* arrived with the first cargo of building material on May 26, when mason work was at once resumed and prosecuted vigorously until the *Del Norte* was discharged and work suspended for the season. The *Whitelaw* was discharged on July 1, as we found the *Del Norte* quite capable of supplying material as fast as we could use it.

At the closing up of the work the thirteenth course of masonry was laid, five courses being built during the season, bringing the pier to a height of 28 feet, excluding zero course, or a total of 32 feet from the bottom bed of zero.

The weather during this short working season was very favorable, and having the workmen's quarters on the rock a vast amount of time was saved daily getting on and off. The work was prosecuted rapidly without accident or delay.

An appropriation of \$200,000 having been made and approved March 2, 1889, bids for the supply of a steamer were invited. They were opened in April, when the steamer *Del Norte*, being the lowest offered, was chartered for \$5,000 per month. She sailed for Humboldt Bay on April 11, where she took on board men and material and proceeded to the rock. Upon arriving we at once repaired moorings, rigged derricks, and began setting stone on the fourteenth course April 30.

The heavy timber dwelling used for workmen's quarters, which was built the previous season, had been badly damaged by the sea during the eight months' interval. Work was pushed with a force of about 50 men, being the utmost which could be employed profitably.

The weather this season was more severe than in 1888, but rather an improvement over 1887. The men's quarters, although strongly built, were smashed in during a gale about 2 o'clock one morning in May. No one was injured, but some of the men were washed out of their bunks.

By October the pier was finished, eight courses being laid during the season, the walls of boiler room, coal rooms, and storerooms built up and arched over, and the paving of pier laid, with the exception of a small portion. The season of favorable weather being now over it was decided to stop the work, measures were taken to secure the property to be left on the rock from damage from winter storms, and the men and steamer were discharged.

Work was continued at the stoneyard and the quarry, preparing stone for the tower, all of which was completed by July 1, 1890, when all the workmen were discharged and the stoneyard placed in charge of a watchman.

No attempt was made to work at the rock during the season of 1890, as the available funds would not warrant it, and no further appropriation was made until September 30, 1890, when \$81,000 became available. This made a total of \$721,000 appropriated, which was the estimated cost of the structure.

Early in 1891 preparations were commenced for the completion of the station, and on March 28, 1891, bids were opened for a supply steamer. The steam schooner *Sunol* being the lowest offered in terms of the specifications, she was accepted at \$4,000 per month; she left San Francisco April 10, with men and supplies, arriving at Humboldt Bay on the 11th, got her cargo of moorings, derricks, lumber, rope, tackle, stone, sand, cement, fresh water, and a working force of 50 men aboard by the 17th, but was delayed by rough weather until the 21st, when she crossed the bar at 10 o'clock a. m., arriving at Seal Rock on the evening of the same day.

We found our quarters on the rock badly wrecked and no mooring buoys in sight;

by the 29th we got all moorings set. Two of our former moorings were recovered by dragging, the other two could not be found, and we had to replace them with new.

By May 1 we got our quarters repaired and the big derrick rigged and commenced setting flagging on top of the pier. The weather during April and the early part of May was rainy, with strong southerly winds and heavy seas most of the time. From the middle of May until October the weather was very mild and favorable for working. We set the first stone of the tower on May 13 and the last on August 23.

A four-boom derrick was rigged inside of the tower for supplying masons with material; it also served for an inside scaffold; a double hoist was also erected for mortar supply, and the falls of both hoists were carried to steam winches.

Only one serious accident happened during the construction of the tower; on June 16, one of the riggers, while letting go a tag line of the big derrick boom was carried over the pier and killed.

From August 23 to October 29 the time was occupied in taking down scaffolding, erecting ironwork, pointing stonework, putting in concrete arches in tower, laying concrete floors in rooms in pier and upper hallways, leveling platform for landings, derrick seat and hoisting-engine bed, building donkey-engine house, plastering rooms in tower, carpenter work, painting metal work, and varnishing all woodwork, and in setting up the fog-signal boilers and machinery. All work was finished by the end of October, but we were unable to get the men from the rock until November 8, owing to the heavy sea. This completed the work with the exception of the lens, which had not arrived from Europe.

The station was left in charge of three keepers, and all men, tools, and rigging put aboard the steamer; all the moorings were lifted and the steamer sailed for San Francisco. The tools were stored in Yerba Buena Island storehouse and the men and steamer discharged November 18, 1891.

DESCRIPTION OF THE WORK.

The outline of the pier being blasted off, the outer base ring 10 feet wide was accurately finished with patent hammers, the center cone was roughly stepped to receive the masonwork, provision being made for storing 77,000 gallons of water in the base.

The outside courses of pier are 2 feet and 2 feet 6 inches high, built in Flemish bond, headers 5 feet deep on bed by 2 feet 6 inches wide on face, the stretchers 2 feet 6 inches on bed by 5 feet 8 inches on face. All the horizontal beds are connected by a 3-inch diameter dowel of gun metal in each block and projecting half its length into the course below except the upper course, in which the dowels were omitted all vertical joints of outside stones were dovetailed or joggled into each other. All the outside joints were three-sixteenths of inch wide; the faces of pier stones were pointed off fine with 2-inch margins cut on joints. The top of pier is laid with stone flagging 12 inches thick, finished with 8-cut patent hammers. This serves as a water shed with a fall of 3 inches from center to gutters cut in the stone at the outer rim, and from thence the water is carried in a 4-inch diameter pipe to the cisterns in the base of the pier. For the prevention of leakage, all the joints in the top of the pier were cleaned out to the depth of 2 inches and then thoroughly calked with sand and cement slightly moistened with boiled linseed oil. All walls of rooms inside of pier—namely fog-signal room, coal rooms, storerooms, hallway, etc.—are of square rubble laid with one-quarter inch joints and faces finished with point and pointed with round jointer leaving a concave joint.

The corners, jambs, lintels, and sills of tower are natural face with 2-inch margins, the corner belt courses and porch are 8-cut patent hammer work, and all the outside joints of the tower are calked the same as top of pier and finished with round jointer.

The brick inside of air spaces is laid in cement mortar, the brickwork in staircases and lower entrance hall is laid in black mortar and finished with raised bead joint.

All outside of pier and tower is laid in mortar composed of one part of Portland

and cement to one part of sand; all inside filling and backing stone is laid in one part of Portland cement to two parts of sand; all the concrete roof arches in pier and the floor arches in tower are composed of one part of Portland cement to one and a half parts of sand and three parts of gravel; the concrete under the fog-signal apparatus, landings, engine bed, and base of derrick is one part of Portland cement to two parts of sand and four parts of gravel or granite chips.

The woodwork is as follows: The floors in keeper's quarters are of seasoned Humboldt pine 1½ by 3 inches, vertical grain, tongued and grooved, laid on joists beveled on upper side and let into concrete arches; all surfaces of floors are polished and varnished. The inside doors, wainscoting, etc., are of Port Orford cedar with redwood panels; all other trimmings are redwood; the outside doors and windows are oak, all finished and varnished. The keeper's rooms are finished with three coats of plaster, and finished.

All the metal work received four coats of paint.

Three tables are inclosed: No. 1 gives the cost of the various items of expenditure and the percentages of each on the entire cost; table No. 2 divides the cost of the tower among the various items, and table No. 3 shows the cost of transportation from the stoneyard to the rock and the amount carried.

Respectfully submitted,

A. BALLANTYNE,
Superintendent of Construction.

TABLE No. 1.—Expenditures incurred in construction of Light-House and Fog-Signal Station on Northwest Seal Rock, St. George Reef, California.

Items of expenditure.	Rock.	Stoneyard.	Stone quarry.	Totals.	Per cent.
Superintendence.....	\$123,578.47	\$78,045.62	\$100,751.86	\$302,375.95	42.9132
.....	15,587.00	18,168.68	8,877.90	42,633.58	6.00
.....	2,343.03	1,535.74	926.68	4,805.45	.6820
.....	15,773.00	.....	.....	15,773.00	2.2330
Buildings and plant.....	45,167.43	13,040.66	8,419.11	66,627.20	9.4560
Transportation.....	123,496.47	807.90	*30,041.39	154,345.76	21.9050
Bricks and lime.....	1,247.87	.....	.....	1,247.87	.1776
Other expenses.....	611.80	559.77	500.23	1,731.80	.2460
Order.....	917.22	.....	719.96	1,637.18	.2323
Land waste.....	399.12	86.62	63.40	549.14	.0780
For glass and metal work.....	12,322.76	.....	.....	12,322.76	1.7490
....., etc.....	15,491.00	.....	.....	15,491.00	2.1990
Fog-signal apparatus.....	3,439.11	.....	.....	3,439.11	.4880
Keelers' materials.....	748.75	.....	.....	748.75	.1062
Painter work, hardware, paint.....	1,084.56	.....	.....	1,084.56	.1540
Belts.....	57,002.41	.....	.....	57,002.41	8.0900
Tables for quarters.....	11,144.41	.....	.....	11,144.41	1.5820
Large dowels.....	2,599.92	.....	.....	2,599.92	.3700
Gravel.....	680.00	.....	.....	680.00	.0970
Signs.....	49.77	.....	13.13	62.90	.0090
Grout.....	92.81	.....	.....	92.81	.0132
Gravel on stone.....	.....	.....	6,841.49	6,841.49	.9710
Feathers.....	.....	.....	438.73	438.73	.0622
Light of way to quarry.....	.....	.....	300.00	300.00	.0430
.....	658.00	.....	.....	658.00	.0933
Total.....	434,434.91	112,244.99	157,953.88	704,633.78	100.0000

*This item includes transportation of stone from quarry to yard.

TABLE NO. 2.—*Cost of labor on different items.*

175,260 cubic feet of stone (granite), quarried at 42.26 cents per foot ...	\$75,067.21
Cutting broken ashlar, 13,091 cubic feet, at 45 cents per foot	5,890.95
Cutting backing (rough squared), 109,965 feet, at 18 cents per foot	19,793.70
Cutting dimension stones, 52,204 cubic feet, at \$1.766	92,220.22
Handling material at yard, 19,610 tons	11,524.45
Preparing site	17,500.00
Plumber	480.00
Carpenters	750.00
Setting up metal work, stairs, railing, etc	890.00
Laying concrete arches, 2,922 cubic yards	2,766.00
Laying concrete floors, 3,340 square feet 2 inches thick	662.00
Erecting engine, engine-house, and derrick	460.00
Painting	360.00
Plastering	480.00
Bricklaying (94,000)	840.00
Setting 175,260 cubic feet of granite, at 41.47 cents per foot	72,685.42
Total	302,375.95

Table No. 3.—*Quantities of material transported to rock from stoneyard.*

	Tons
Stone	14,307
Sand	1,438
Wood and metal	100
Cement	915
Fresh water	1,737
Coal	220
Provisions	90
Brick	136
Tools, derricks, rope, chain, etc	85
Gravel	172
Total	19,610
At \$6.296 per ton, \$123,496.47.	

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